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JOURNAL OF PALEONTOLOGY

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CONTENTS

Brachiopoda of the Percha shale of New Mexico and Arizona..*Merrill A. Stainbrook* 297
Cretaceous microfossils of the Vermilion area, Alberta.....*Arthur W. Nauss* 329
The genotype of the Isoarca (class pelecypoda) .....*David Nicol* 344
Tropical American species of *Glycymeris* from the Tertiary of California, and a new species from Panama.....*David Nicol* 346
A *Koninckioceras* from the Lower Permian of north-central Texas.....
.....*A. K. Miller and Augusta Hasslock Kemp* 351
Index to new genera, species and varieties of Foraminifera for the year 1945, with supplements for the period 1939-1944, and addenda for 1942-1945.....
.....*Hans E. Thalmann* 355

PALEONTOLOGICAL NOTES

A new species of *Asterigerina* from the Upper Liassic of England .....*A. ten Dam* 396
Committee on techniques in invertebrate paleontology 397
Notes on techniques in invertebrate paleontology .....*Franco Rasetti* 397
University of Kansas paleontological contributions 408

NOMENCLATURAL NOTES

New names for junior homonyms 400
UNESCO aid for the International Commission on Zoological Nomenclature 400

SOCIETY RECORDS AND ACTIVITIES

Reports and minutes of the twenty-first annual meeting of the Society of Economic Paleontologists and Mineralogists 401

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BRACHIOPODA OF THE PERCHA SHALE OF NEW MEXICO AND ARIZONA

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Brandon, Iowa

ABSTRACT.—Thirty-four species of brachiopods from the Percha shale of New Mexico and Arizona are described and illustrated; 21 are new. They are assigned to 27 genera of which four are new,—*Leioproductus*, *Planoproductus* and *Bispinoproductus*, productids, and *Strophopleura*, a laminose spiriferid. The productids which dominate the brachiopods in the Percha were formerly all referred to *Productella;* here nine genera and eleven species are recognized. Although the Percha and lower Ouray have hitherto been regarded as Upper Devonian, evidence afforded by the brachiopods and other fossils favors early Mississippian age.

INTRODUCTION

THE present paper on the Percha brachiopods is the result of efforts directed primarily towards ends other than those here reported. Following work on the Upper Devonian of Iowa, I have, at various times collected and studied other Upper Devonian faunas in order to discover, if possible, whence the Iowa faunas were derived. Study of faunas collected or described from northeastern, eastern or southeastern parts of the United States have furnished no solution to this problem. Near Alamogordo, New Mexico, however, a fauna was discovered which is closely related to that of the Independence shale of Iowa. It was collected from beds that have been included in the Percha shale but their fauna is totally different from that of the typical Percha and these strata were named the Sly Gap formation by Stevenson, (1945). The Lime Creek fauna of Iowa had been found previously (Keyes, 1908) in the Martin limestone of Arizona. Obviously there are Devonian formations in this region other than the Percha (Stainbrook, 1935).

Collections made during the last 15 years at several Percha localities have yielded a fairly extensive and representative fauna. Study of the latter, however, threw little light on the derivation of the late Devonian faunas of Iowa as these have little in common with the Percha. In fact the Percha fauna seems to contain few definitely Devonian species.

Collections from the Percha shale were made at three localities in New Mexico and one in Arizona. Most of the fauna was collected from the sides of a nearly isolated hill about 3 miles southeast of Hillsboro, New Mexico, and about a quarter of a mile south of the box canyon on Percha Creek. The upper beds of the Percha are here moderately well exposed and yielded abundant specimens. The hill is capped by limestone from which a large number of crinoid calices and brachiopods of Lake Valley age were obtained. A second small collection was made in the region west of Kingston. The

third locality is at the eastern foot of the San Andres mountains about a mile south of Rhodes' Pass. This small collection contains several typical forms and indicates that the upper beds of the Percha are present although Stevenson (1945) suggested that they do not occur in the San Andres mountains.

Near the top of Mt. Martin at Bisbee, Arizona, a small poorly preserved collection was obtained. Among its two dozen specimens are several characteristic Percha species including *Paurorhyncha cooperi* Stainbrook, n. sp., and *Syringospira prima* Kindle. This occurrence is important because it shows that the Percha is younger than the Martin limestone carrying *Spirifer hungerfordi.*

Special care was taken to avoid mixing Percha specimens with those from the Lake Valley above. Specimens from these formations are readily distinguishable because of difference in preservation, as the fossils of the Lake Valley are usually more or less silicified. There seems to have been little mixing, however, because no crinoid similar to the nearly one hundred specimens found on the summit of the hill was collected on the slopes below. A few other specimens which could not be traced directly to the Percha were discarded.

While collecting from the Percha no stratigraphic studies were made other than to locate the top and bottom of the formation, if exposed, and to verify the position of the beds with respect to adjacent formations. My interests have been chiefly paleontological and an extended survey of the formation was beyond my means and time.

PERCHA SHALE

The Percha shale was described and named by Gordon (1907) apparently from exposures on Percha creek, Sierra county, New Mexico. Two members were distinguished at Lake Valley, an upper series of grayish-yellow and bluish shales, 60 feet thick, and a lower black fissile shale. The formation was stated to be enclosed between Mimbres limestone below and the Lake Valley limestone above. The fauna was later determined (Kindle, 1909) to be equivalent to the Ouray fauna of Colorado and the Percha and Ouray were correlated.

In 1908 Keyes recognized the distinctness of two members in the Percha and gave names to each. The basal black shale was termed Silver from Silver City, New Mexico and the upper, lighter colored shales, were termed Bella from the Bella mine near Lake Valley, in the same state, where they were reported to underlie the Berenda limestone. Recently Stevenson (1945) proposed the name, Ready Pay, for the lower fissile black shale and the name, Box, for the upper member. There is little doubt that these names were proposed for identical divisions of the Percha. Although Stevenson's type localities are more precise than those of Keyes, there is little reason to replace the earlier names.

THE FAUNA

The Percha fauna is dominated by brachiopods both in number of species and in individuals. They are, with one exception, articulates. The orthoids are represented by two genera, each with a single species and the strophomenids by one genus and species although *Leptaena*, possibly, should be included here. Productids are the predominant group of brachiopods with nine genera and 11 species. The telotremes are strongly but unequally represented and furnish numerous good index species. Four genera, each with a single species, are rhynchonellids. The spiriferids are next in abundance to the productids with seven genera and nine species. One genus, with three species, is closely related to *Cyrtospirifer*. There are no Atrypidae but the athyrids are represented by two genera and four species.

The remaining macrofossils include two simple tetracorals and one tabulate. Eight species of bryozoa referred to seven genera have been described by Miss Fritz (1944). *Spirorbis* represents the annelids. Numerous crinoid stems occur and there is one species of *Archeocidaris*. Mollusks are moderately common but poorly preserved, mostly as internal molds. One pelecypod, five species of gastropods and several orthoceratoids occur. The collections also include one trilobite pygidium.

AGE OF THE FAUNA

The Percha fauna was discovered in New Mexico by Gordon and Graton (1906) and

collections were referred by them to Kindle who later described several species from this formation as well as many others from the Ouray limestone of Colorado (1909). He showed that the Percha fauna is similar to that of the Ouray and his correlation of the two formations has been accepted generally. Kindle followed Girty's determination of the age of the Ouray as Upper Devonian and supported it by his identification of Devonian species from the Percha. So far as known the assignment of the Percha to the Upper Devonian has not been questioned but the present study of Percha brachiopods aroused doubt in the mind of the writer and a review of the age of this fauna seems necessary.

As the Ouray fauna was discovered and discussed before that of the Percha, it is considered first here. This fauna was collected in Colorado from limestone to which the name Ouray was later applied by Spencer (1900). The strata were generally referred to the Devonian, at first chiefly on the basis of their stratigraphic position. Later the presence of Devonian fossils in the lower part of the limestone and of Mississippian species in the upper beds was noted. In 1875 Meek described *Rhynchonella endlichi* from the lower part of the limestone and suggested that it was probably Upper Devonian. White (1883) described the same species but referred it to the lower Carboniferous. Schuchert (1897), reviewing the occurrence of this brachiopod, agreed with Meek. In 1894 Eldridge described the Leadville limestone which was assigned to the Sub-Carboniferous on the basis of its fossils. Burbank (1930) considered the Ouray chiefly Mississippian but with Devonian beds included below because fossils from 15 to 20 feet above the base were identified by Kirk as Upper Devonian. In 1931 Kirk correlated the upper portion of the Ouray, which bears Mississippian species, with the Leadville and restricted the Ouray formation to the supposed Devonian strata. The fossils described by Girty and Kindle from the Ouray were collected from the formation as thus restricted.

Girty (1900) described and figured many of the Ouray species and reviewed the evidence for their age. He concluded that the Ouray was not older than Middle Devonian and might be as young as early Upper Devonian. His arguments against a Mississippian age may be reviewed with profit. First, the presence of an *Orthis* related to *Schizophoria striatula* was considered important as no orthoid of this type was then known in this country in early Carboniferous rocks. This brachiopod, *Schizophoria australis* Kindle, is not necessarily indicative of Devonian age. It is not closely related to *Schizophoria striatula* but in size more nearly approaches *Schizophoria swallovi* of the Burlington limestone. The genus has representatives in the Mississippian and even in the Pennsylvanian system.

Girty noted that the productoids of the Ouray, although of Devonian type, would not be out of place in the Mississippian but stated that characteristic Carboniferous species are significantly absent. However, significant Devonian species are likewise absent. Of the typical productid genera known in the Upper Devonian of Iowa and southwestern United States, neither *Productella* nor *Devonoproductus* occurs in the Ouray, *Echinoconchus*, represented by *Productus laminatus* Kindle, has been reported only from the Mississippian. *Productella depressa* Kindle is probably not a true *Productella* as its type of spines and sulcus are not characteristic of that genus.

Girty stated that species of *Athyris* are uncommon in the Carboniferous but Weller (1914) described five Mississippian species. *Athyris coloradensis*, considered by Girty to be related to *Athyris spiriferoides* of the Hamilton, appears to resemble Mississippian forms more closely and is probably a *Cleiothyridina*. His most important evidence was the occurrence in the Ouray of two Spirifers of Devonian appearance. One, *Cyrtospirifer kindlei* Stainbrook, n. sp., was said to be allied to *Spirifer disjunctus*. Kindle (1909) referred this species to *Spirifer whitneyi* but it is certainly not conspecific with either of the species named. The second, *Cyrtospirifer animasensis* (Girty), was considered to be similar to *Spirifer asper* of the Cedar Valley beds of Iowa. This similarity, however, is not close because the species are generically distinct. Kindle described this form as a variety of *Spirifer whitneyi* but it is not closely related to that species. The genus *Cyrtospirifer* to which

these two Ouray species probably belong, although there are features suggesting that they should be separated as a new genus, is certainly most characteristic of the Upper Devonian. The writer, however, does not consider this decisive. *Cyrtospirifer kindlei* possesses internal and external characteristics which indicate that it is in a later stage of evolution than Upper Devonian representatives in adjacent regions of the southwest and in Iowa. Spiriferoids with plicate and costate fold and sulcus are numerous in the Mississippian and it cannot be demonstrated that *Cyrtospirifer* became extinct at the close of the Devonian. Therefore, this evidence supporting the Upper Devonian age of the Ouray appears to the writer to be rather weak and certainly not conclusive.

Because the Percha fauna is definitely correlated with that of the Ouray, these same objections to its Devonian assignment are pertinent. Moreover no definitely Devonian species are known from the Percha and such typical Upper Devonian forms as *Cyrtospirifer whitneyi*, *Atrypa reticularis*, *Atrypa* with spines, *Theodossia hungerfordi* and other species of the Upper Devonian formations in or adjacent to New York are significantly absent. The Percha productoids, formerly referred to *Productella*, represent nine genera none of which is known from the Devonian. *Camarotoechia congregata* and *Meristella barrisi* reported by Kindle from the Percha were incorrectly identified and the latter is a new species of *Composita*, a genus not recognized in the Devonian.

The fossils listed by Darton (1917) from the Percha formation in the San Andres mountains, which are certainly Devonian, were collected from lower beds now referred to the Sly Gap formation and not from the Percha as now restricted. Cooper (1942) stated that a few species in the Percha fauna, such as *Athyris coloradenis*, suggest Mississippian rather than Devonian age. The Percha fauna is wholly distinct from the Upper Devonian faunas of Iowa as well as from the Upper Devonian faunas of the southwest such as those of the Martin limestone of Arizona and the Sly Gap formation of New Mexico and no close relationships are apparent. Therefore, the evidence cited by previous writers does not definitely establish an Upper Devonian age for the Percha.

Because the Percha overlies the youngest definitely Devonian formation in the region, the Martin limestone with *Theodossia hungerfordi*, its relations may be closest with the basal formations of the Mississippian. A review of the brachiopods, as identified and described here furnishes significant evidence regarding the age of the formation. The single neotreme, *Petrocrania ourayensis* may be disregarded, as the genus is long ranging. The orthoids, also, are indefinite but *Schizophoria australis* Kindle resembles *Schizophoria swallovi* of the Burlington limestone, and the *Rhipidomella* appears to be related to *Rhipidomella jerseyensis* of the Fern Glen. The strophomenids are noncommittal. *Schellwienella percha* Stainbrook, identified by Kindle as *Schuchertella arctostriata*, is similar to Mississippian *Schellwienellae* which are fairly numerous. *Leptaena rhomboidalis* of Kindle from the Ouray is actually the form commonly identified as *Leptaena analoga* Phillips and appears to be identical with specimens from the Lake Valley limestone. This species, however, has not been collected from the Percha by the writer.

Productids are abundant in the Percha and all agree in supporting a post-Devonian age for the formation. Nine genera are recognized—*Avonia*, *Buxtonia*, *Pustula*, *Krotovia* (two species) *Heteralosia*, *Echinoconchus*, *Bispinoproductus* (two species), *Planoproductus*, and *Leioproductus* (two species) all erected since Girty and Kindle considered the age of the Percha fauna. Of these, the first six are certainly Mississippian and have never been reported from any Devonian fauna. The last three, newly diagnosed, likewise have no known Devonian representatives.

Among the rhynchonellids, *Camarotoechia* is both Devonian and Mississippian, but the Percha species does not seem to be *Camarotoechia contracta* of the New York Devonian and this identification was questioned by Kindle (1909). *Paurorhynchus*, based on *Rhynchonella endlichi* Meek, is not known elsewhere in beds definitely ascertained to be either Devonian or Mississippian. However, *Paraphorhynchus*, repre-

sented by *P. perchaensis* (formerly identified by Kindle as *Pugnax pugnus*) and *Shumardella* (*S. glabraventra* Stainbrook) are as definitely Mississippian as the productids. The latter genus has only Mississippian representatives, the former is not known from beds of certain Devonian age.

The only terebratulid is referred to *Dielasma*, which may be either Devonian or Mississippian.

The spiriferids give somewhat conflicting evidence. *Cyrtospirifer*, represented by three species, is known from the Upper Devonian but the three Percha species are distinct from any known from beds of that age. Its occurrence with several distinctly Mississippian genera lessens its importance as an indication of the Devonian. Like many other genera, it may have survived from one period into the next. This is suggested by the reported occurrence of *Spirifer disjunctus* in New York and Pennsylvanian in the "Stony Lonesome" beds in association with three species of *Paraphorhynchus*, *Syringothyris*, and a *Torynifer*, all good Mississippian genera (Chadwick, 1935).

Brachythyris and *Torynifer* add further evidence to the Mississippian age of the Percha fauna, as these genera occur only in that system. *Syringospira*, with one possible exception, is unknown in the Upper Devonian and appears to be a late evolutionary development in the spiriferids. Cooper (1944) has recently assigned *Spirifer altus* Hall to *Syringospira*, which it resembles in form. The peculiar delthyrial tube characteristic of the genus, however, does not appear in the illustration of the internal mold of the pedicle valve of this species nor is it mentioned in Hall's description and until its presence is demonstrated, this generic reference and the occurrence of the genus in the Devonian may be questioned. The new genus *Strophopleura*, a laminose spiriferoid, has no known Devonian representative, but *Strophopleura novamexicana* (Miller) is present in the Mississippian Lake Valley formation. *Tylothyris*, with one species, is in accord with Mississippian age.

No *Atrypa* has been collected from the Percha and the absence of this genus from any Devonian fauna is so unusual that its nonoccurrence is almost indicative of non-Devonian age. The athyroids are represented by two genera. *Composita*, with one species (*Meristella barrisi* Hall? of Kindle), appears to be good evidence of Mississippian age as no Devonian species is known. *Cleiothyridina* is represented by three species, one being *Athyris coloradensis* Girty. This genus is almost exclusively Mississippian and one species is present in the Pennsylvanian. A form, similar to *Athyris coloradensis*, has been described from the Three Forks formation of Montana where it is associated with species of both Mississippian and Devonian appearance.

Evidence afforded by other macrofossils may be briefly summarized. The single annelid, a species of *Spirorbis* has little or no time significance. Eight species of bryozoans belonging to several genera have been described by Miss Fritz (1944). *Eridotrypella* is known elsewhere from the Devonian, *Fistulipora* ranges from Ordovician to Permian, *Ptiloporella* is Siluro-Devonian, *Rhopalonaria* ranges from Ordovician to Mississippian, *Semicoscinium* from Silurian to Devonian, *Leptotrypa* from Ordovician to Devonian, and *Leptotrypella* is Devonian as far as known. Miss Fritz stated that the species of *Rhopalonaria* distinctly resembles one from the Keokuk of Iowa, and thus may have more stratigraphic significance than was granted by her.

Mollusks are not uncommon but they generally occur as internal molds and cannot be identified accurately. The one pelecypod, *Aviculopecten*, is of little use in dating the fauna. Five genera of gastropods, tentatively identified, are long ranging and, therefore, inconclusive. *Bellerophon* and *Naticopsis*, however, are represented by specimens similar to and nearly identical with species from the Lake Valley. Several cephalopods, identified as *Michelinoceras*, may be either Devonian or Mississippian.

A single mold of a pygidium of *Brachymetopus*, similar to *B. spinosus* (Herrick) resembles a species occurring in the Lake Valley limestone and appears to indicate Missippian age rather than Devonian.

CONCLUSIONS

Evidence for the Devonian age of the Percha shale is very weak. No definitely

Devonian fossils are included in its fauna and Percha genera known from the Devonian are mostly long-ranging. The occurrence of *Cyrtospirifer* is the main support for a Devonian age determination but the association of this genus with a probable Mississippian fauna in the eastern United States greatly lessens its significance. Six genera, *Petrocrania*, *Schizophoria*, *Rhipidomella*, *Schellwienella*, *Camarotoechia* and *Dielasma*, occur in both systems and therefore do not support a Devonian age. The bryozoa are suggestive of the Devonian, but several of the reported genera are long ranging and indecisive. No bryozoan species described from the Percha is known elsewhere in the Devonian.

Evidence afforded by the brachiopods is preponderantly in favor of the Mississippian and appears convincing. Thirteen genera, *Heteralosia*, *Echinoconchus*, *Krotovia*, *Pustula*, *Buxtonia*, *Avonia*, *Paraphorhynchus*, *Shumardella*, *Brachythyris*, *Torynifer*, *Composita*, and *Cleiothyridina*, are Mississippian and have not been reported from any formations of certain Devonian age. Five other genera, *Leioproductus*, *Heteracanthus*, *Planoproductus*, *Paurorhyncha*, *Syringospira* are distinctive of the Percha and have not been reported from any definitely Devonian formation. One of them, *Strophopleura*, occurs in the Mississippian Lake Valley limestone. *Archeocidaris* and *Brachymetopus* favor Mississippian age. Evidence of the mollusks and corals is inconclusive but not out of harmony with this conclusion.

The Percha shale as now recognized should not be confused with formations such as the Sly Gap and Canutillo, which contain definite Devonian faunas. The Percha fauna is more closely related to that of the overlying Mississippian than to the underlying Devonian and the Mississippian system in New Mexico seems to begin with a body of black shale, the Silver member, similar to the basal black shale of the Mississippian system in many other parts of North America.

The Percha fauna is most closely related to that in the lower part of the original Ouray limestone, which has generally been considered Devonian. The upper part of the Ouray now correlated with the Leadville, has been consistently regarded as Mississippian. If the Percha be Mississippian, the lower Ouray is Mississippian also, and the Devonian is but scantily represented in Colorado.

If the Percha is Mississippian, spiriferoids of the type of *Spirifer disjunctus* are demonstrated to have persisted beyond the close of the Devonian period. This is important in connection with the age determination of some other borderline Mississippian-Devonian formations.

In his paper on the Devonian of New Mexico, published in 1945, Stevenson stated his intention of studying the Percha fauna. At that time my own investigation of the Percha brachiopods was nearly completed and my manuscript was undergoing final revision.

All specimens described and illustrated are in my private collection. Illustrations are natural size unless otherwise indicated.

SYSTEMATIC DESCRIPTIONS

Order NOETREMATA Beecher

Family CRANIIDAE King

Genus PETROCRANIA Raymond

PETROCRANIA OURAYENSIS (Kindle)

Plate 45, Figure 10

Crania ourayensis, Kindle, 1909, U.S.G.S. Bull. 391, p. 15, pl. 1, figs. 2, 2a.

One pedicle and two brachial valves present no features not noted in the original description. Two specimens attached to *Schizophoria australis* have corrugated brachial valves reflecting the costae of the latter. The largest specimen is 14.8 mm. in diameter and approximately 4.5 mm. thick.

There is little to distinguish this species from *Crania missouriensis* Weller of the Kinderhook or *Crania famelica* Hall and Whitfield of the Upper Devonian of Iowa. It apparently differs from *Lissocrania dodgei* (Rowley) of the Louisiana limestone by the lack of a sharply pointed apex. Possibly it should be referred to Williams' genus, *Lissocrania*. The species probably has little stratigraphic value.

Occurrence.—Percha formation, upper beds at Hillsboro, New Mexico.

Types.—Hypotypes M. A. S. 1582.

Order PROTREMATA Beecher
Suborder ORTHOIDEA Schuchert and Cooper
Family SCHIZOPHORIIDAE Schuchert
Subfamily SCHIZOPHORIINAE Schuchert
Genus SCHIZOPHORIA King
SCHIZOPHORIA AUSTRALIS Kindle
Plate 45, figures 1–2, 7–8

Schizophoria striatula. Girty, 1900, 20th Ann. Rept. U.S.G.S. pt. 2, p. 39.
Var. *australis*, Kindle, 1909, U.S.G.S. Bull. 391, p. 21, pl. 1, figs. 4–8, pl. 2, figs. 1–5a; pl. 3, figs. 1.

This is one of the commoner species of the Percha but complete or nearly perfect specimens are scarce. It is also one of the largest representatives of the genus but no individual collected by the writer has dimensions equalling the maximum reported by Kindle. Three specimens measure as follows: length 33.8 mm., 39.5 mm., and 41.1 mm.; width 46.4 mm., 50.8 mm., and 45.6 mm.; thickness 23.2 mm., 26.1 mm., and 28.2 mm. The third is relatively longer, narrower and thicker than the others. An incomplete pedicle valve is 43.6 mm. long.

Distinctive features other than the large size are few. Beaks are rather inconspicuous and both they and the umbos are only slightly curved. The cardinal area of the pedicle valve is quite small, low and inclined to the plane of the valve; its width is generally about one-third that of the shell. The muscle scars of the pedicle valve are small, relatively long and narrow. They are separated by a distinct median ridge which increases in height and strength to the anterior emargination of the scars and continues, but becomes lower and narrower nearly to the front of the valve.

The costae of both valves are moderately strong, narrow, erect, and are separated by nearly flat-bottomed furrows of about equal width. They are slightly variable in size especially along the front margin. Pores on the costae are oblong to circular and often are conspicuously crowded on the postero-lateral angles of large specimens.

The larger size and other features appear sufficient to separate this species from *S. striatula* Schlotheim of the Middle Devonian. It is readily distinguished from Upper Devonian members of the genus by size alone. It differs from *S. magna* Fenton and Fenton in shape, size of the cardinal area of the pedicle valve and in the nature of the costae. From *S. laudoni* Stainbrook of the Cedar Valley of Iowa it differs in outline, in having a more convex pedicle valve, a smaller cardinal area and differently shaped pedicle muscle scars, and the internal median ridge of the pedicle valve is not bounded by deep lateral grooves. An undescribed species from the Callaway limestone of Missouri illustrated by Schuchert and Cooper is nearly as large as this species, but differs in shape, in size and form of muscle scars of the pedicle valve and lacks the strong median internal ridge.

S. australis is similar to *S. swallovi* (Hall) of the Mississippian in size and in the smallness of its cardinal area. Pedicle valves of the two species are almost identical in outline and size but that of *S. australis* has a well developed sulcus while the other is nearly flat.

Occurrence.—Percha shale, Bella member, southwest of Hillsboro, Kingston and east end of Rhodes' Pass, San Andres Mts., New Mexico; Mt. Martin, near Bisbee, Arizona.

Types.—Hypotypes M.A.S. 1600, 1625.

Genus RHIPIDOMELLA Oehlert
RHIPIDOMELLA MANTICULA
Stainbrook, n. sp.
Plate 45, figures 3–6

Shell small, unequally biconvex, subquadrate in outline, wider than long, broadest at the midlength or anterior, hingeline short and about one third the width of shell, the posterior angles more rounded than the antero-lateral margins. Dimensions of holotype and a paratype are: length 9.4 mm. and 11.5 mm.; width 10.6 mm. and 13.8 mm.; thickness 4.6 mm. and 5.7 mm.

Pedicle valve the more convex, highest anterior to the middle, gently arched thence to beak, more strongly to the front margin. Surface gently elevated along midline from umbo toward front into an indistinct fold, curving with moderate rapidity to the sides, gently concave on both sides of the beak. Umbo narrow, low; beak small, pointed, projecting. Area low, curved and with small delthyrium. Interior unknown.

Brachial valve gently convex, curved over beak and at front, flattened between. Me-

dian portion depressed into a shallow sulcus extending from beak to front, broadly rounded at bottom and merging gradually at sides with lateral slopes. Beak small, pointed, projecting. Interior unknown.

Exteriors of both valves marked by numerous radial costae, coarse, angular at summits, increasing by division, straight in the medial portions of the valve, curving laterally on the slopes, tending to be grouped into fascicles, separated by deep furrows as wide or wider than the costae at the margins. Growth lines few, occasionally strongly developed.

This species most closely resembles *Rhipidomella jerseyensis* Weller in general shape, but is smaller, proportionately broader and has coarser costae.

Occurrence.—Percha shale, Bella member at Hillsboro, and at east end of Rhodes' Pass, San Andres Mts., New Mexico.

Types.—Holotype M.A.S. 1589 A; paratypes M.A.S. 1589. and 1617.

Superfamily STROPHOMENACEA Schuchert
Family STROPHOMENIDAE King
Subfamily RAFINESQUININAE Schuchert
Genus LEPTAENA Dalman
LEPTAENA ANALOGA (Phillips)
Plate 45, figure 11

Leptaena rhomboidalis, Kindle, 1909, U.S.G.S. Bull. 391, p. 16, Pl. 1, fig. 3.
Leptaena analoga, Weller, 1914, Ill. Geol. Surv. Mono. 1, p. 49, Pl. 2, figs. 1–10.

Kindle reported two specimens from the Percha at Hillsboro, New Mexico, where my principal collection was made. I have four incomplete examples of this species from this locality, but all are from the Lake Valley limestone which carries numerous crinoids and none was observed in the Percha shale below. Possibly Kindle's specimens were collected out of place from talus of the Lake Valley. If they actually came from the Percha they furnish evidence pointing to the Mississippian age of that formation.

My specimens from the Lake Valley appear to be identical with the one illustrated by Kindle and also with those illustrated by Weller from the Fern Glen formation of the Mississippi Valley.

Occurrence.—Lake Valley limestone at Hillsboro, New Mexico.

Types.—Hypotypes; M. A. S. 1586.

Subfamily ORTHOTETINAE Waagen
Genus SCHELLWIENELLA Thomas
SCHELLWIENELLA PERCHA
Stainbrook, n. sp.
Plate 45, figures 9, 12–13

Schuchertella chemungensis Kindle, 1909, U.S.G.S. Bull. 391, p. 16, pl. 3, figs. 2–4a.

Shells small to medium in size, resupinate, wider than long, subquadrate in outline with hingeline slightly less than the greatest width, broadest a little anterior to hingeline. Measurements of the holotype, an incomplete specimen, are: length 26.5 mm.; width 40.1 mm. (one side restored); thickness 8.7 mm. A small paratype is 19.9 mm. long, 16.9 mm. wide and 5.9 mm. thick.

EXPLANATION OF PLATE 44

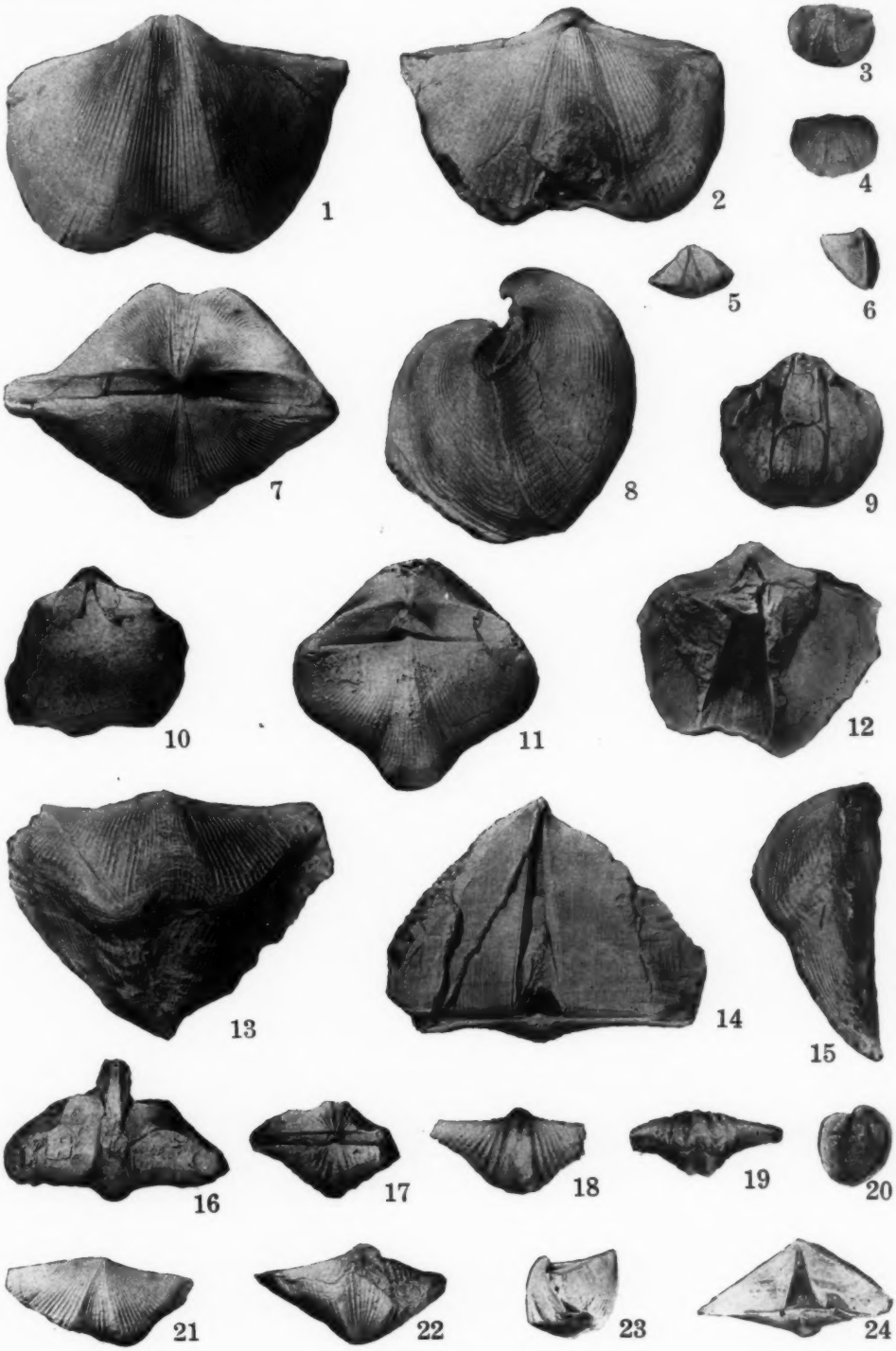
FIGS. *1, 2, 7–12—Cyrtospirifer kindlei* Stainbrook n. sp. *1–2, 7–8*, Pedicle, brachial, posterior and lateral views of holotype, M.A.S. 1591 A. *9*, Pedicle valve with shell partly broken away revealing long delthyrial supporting plates. *10*, Cardinal view of young pedicle valve showing small transverse delthyrial plate. *11*, Anterior view of specimen with nearly complete convex deltidium. *12*, Internal view of pedicle valve showing long delthyrial supporting plates and transverse plate which rises to become a convex deltidium, irregularly shaped near hingeline. All M.A.S. 1591, Hillsboro, New Mexico. (p. 318)

3–6—Cyrtospirifer breviposticus Stainbrook, n. sp. Pedicle, brachial, posterior and lateral views of holotype, M.A.S. 1631 A, San Andres Mountains, near Rhodes' Pass, New Mexico. (p. 320)

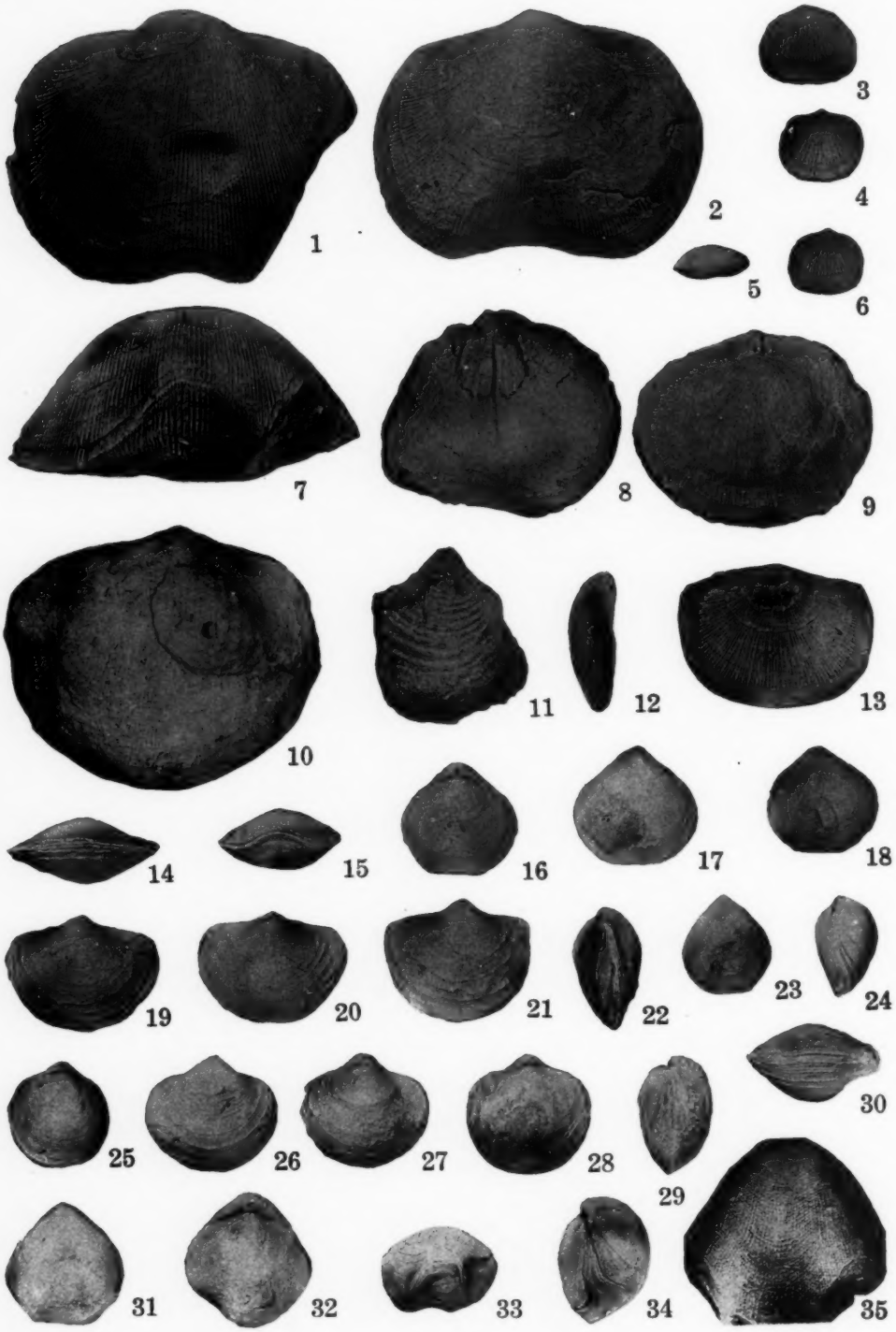
13–16—Syringospira prima Kindle. *13–15*, Anterior, posterior and lateral views of nearly perfect specimen. *16*, Posterior view of weathered specimen showing shape of the tube. Both M.A.S. 1582, Hillsboro, New Mexico. (p. 323)

17–20—Strophopleura notabilis (Kindle). *17*, Posterior view showing convex deltidium. *18–19*, Pedicle and anterior views; *20*, Lateral views of two specimens. All M.A.S. 1586, Hillsboro, New Mexico. (p. 324)

21–24—Cyrtospirifer animasensis (Girty) Pedicle, anterior, lateral and posterior views, M.A.S. 1584, Hillsboro, New Mexico. (p. 318)



Stainbrook – Percha Brachiopods



Stainbrook – Percha Brachiopods

Pedicle valve moderately to slightly resupinate, (that of holotype is nearly flat). Surface elevated in umbonal region, depressed or flat centrally and toward lateral and anterior margins. Beak small, slightly extended and may be a little twisted. Umbo broadly convex, low. Cardinal area moderately high, decreasing in height to near angles, nearly flat, posteriorly inclined toward plane of valve, marked by fine transverse striae; division into regions not apparent because of imperfect preservation. Delthyrium about as broad as high, completely closed by a convex deltidium.

Brachial valve depressed convex, the surface elevated in umbonal region and forward, depressed toward the postero-lateral angles. Beak small, area linear.

Radial costae abundant, increasing by intercalation, variable in size, the third or fourth at front margin generally being larger. Surface also marked by a few strong concentric growth wrinkles which may be strong enough to interrupt the costae, and by minute concentric ridges more prominent in the intercostal furrows where they produce an irregular appearance.

Six specimens are apparently conspecific with the forms described by Kindle from Colorado. Kindle noted that none was obtained in New Mexico. Two only of my specimens are well preserved and they are small, the largest is incomplete. All possess a convex brachial valve and a concave or resupinate pedicle valve indicating that they should be referred to *Schellwienella* as that genus is understood by authors generally.

The Devonian species to which Kindle referred this form apparently is highly variable and has a considerable stratigraphic range. The specimens illustrated by Hall (N. Y. IV, Pl. 10) do not agree with mine. Hall quoted Conrad's original description and gave no measurements. Although *Schuchertella chemungensis* has been referred to at various times it does not appear to have been accurately described. *Schuchertella arctostriata* Hall was stated to be from one-fourth to three-fourths of an inch long, and from one-fourth to one-third wider than long. If these measurements are typical it is considerably smaller than my largest specimen.

Schellwienella is well represented in Mississippian strata but this species apparently is not the same as any of those described and illustrated by Weller. This species resembles most nearly *Schuchertella rubra* Weller but differs in not having a convex pedicle valve.

EXPLANATION OF PLATE 45

FIGS. *1, 2, 7, 8—Schizophoria australis* Kindle. *1, 7*, Brachial and anterior views; *2*, pedicle views of two specimens. *8*, Internal mold of pedicle valve. All M.A.S. 1600, Hillsboro, New Mexico. (p. 303)

3–6—Rhipidomella manticula Stainbrook, n. sp. *3–4*, Pedicle views of two specimens, M.A.S. 1589. *5–6*, Anterior and pedicle views of holotype, M.A.S. 1589 A. All from San Andres Mountains near Rhodes' Pass, New Mexico. (p. 303)

9, 12, 13—Schellwienella percha Stainbrook, n. sp. *9*, Brachial view, M.A.S. 1593. *12–13*, Lateral and pedicle views of holotype, M.A.S. 1593 A. Both from Hillsboro, New Mexico. (p. 304)

10—Petrocrania ourayensis (Kindle). Brachial view of specimen attached to *Schizophoria australis*. M.A.S. 1582, Hillsboro, New Mexico. (p. 302)

11—Leptaena analoga (Phillips). Pedicle view of an incomplete specimen from Lake Valley limestone, for comparison with Kindle's *Leptaena rhomboidalis* from Percha shale. (p. 304)

14, 19–22—Cleiothyridina? transversa Stainbrook, n. sp. *14, 19–20*, Anterior, pedicle and brachial views of holotype, M.A.S. 1595 A. *21–22*, Pedicle and lateral views of another specimen, M.A.S. 1595. Both from Hillsboro, New Mexico. (p. 327)

15–18, 23, 24—Composita bellula Stainbrook, n. sp., *15–17*, Anterior, brachial and pedicle views of holotype, M.A.S. 1583 A. *18*, Pedicle view. *23–24*, Pedicle and lateral views of an elongate specimen. Both M.A.S. 1583. All from Hillsboro, Mew Mexico. (p. 325)

25–30—Cleiothyridina? coloradensis (Girty). *25*, Brachial view; *26–27*, pedicle and brachial views; *28–30*, brachial, lateral and anterior views of three specimens. All M.A.S. 1592, Hillsboro, New Mexico. (p. 327)

31–35—Cleiothyridina reticulata Stainbrook, n. sp. *31–32*, Pedicle and brachial views of holotype, M.A.S. 1588, A. *33–34*, Anterior and lateral views of a paratype, M.A.S. 1588. *35*, Pedicle view of holotype, ×2, showing spine bases. All from San Andres Mountains, near Rhodes' Pass, New Mexico. (p. 326)

Occurrence.—Percha formation, Bella member at Hillsboro, New Mexico.

Types.—Holotype, M. A. S. 1593 A; paratypes M. A. S. 1593.

Family PRODUCTIDAE Gray

This family is well represented in the Percha fauna, and eleven species referred to nine genera, three of the latter new, are distinguished. The five species previously known had all been placed in *Productella*, the only genus recognized by Kindle. As shown by a study (Stainbrook, 1943) of the genotype and related species from the Upper Devonian of Iowa, none of the Percha species has the characters of *Productella*. These species have, therefore, been referred to other genera all proposed since Kindle made his study.

As stated in the introduction, study of the productids of the Percha was undertaken mainly in the hope that they would, by their evolutionary features, yield evidence fixing the ages of certain Devonian or Mississippian boundary-line formations. In general they have fulfilled expectations. Most of them possess easily recognized characters and appear to be stratigraphically significant.

This family has received much attention from paleontologists and many genera have been described. I have hesitated to add to this number but each new generic diagnosis requires finer differentiation, especially if based on evolutionary characters, and results in the greater usefulness of these fossils in stratigraphic work.

Sutton (1938) reviewed the development of this family's classification, discussed the phylogeny and presented a revised classification. The latter differs from that used here in that he suppressed the subfamily Strophalosiinae and transferred its members to the subfamily Productellinae. I prefer to follow Schuchert in dividing the Productidae into three sub-families, because this seems to be in general accord with morphology and evolution. As knowledge of this family is incomplete, any classification is subject to correction and change and the following arrangement is suggested as a tentative working classification. It is not only meant to serve as a key but also is intended to suggest taxonomic relationships.

Family PRODUCTIDAE Gray
Subfamily PRODUCTELLINAE Schuchert and Le Vene 1929

Shells non-costate, anterior occasionally plicate or partially so; spines present, usually on pedicle valve only, erect, strong, their bases circular and only occasionally elongate; cardinal areas usually present in early forms, absent in some later genera.

Spines present on pedicle valve only
- With area on pedicle valve; *Productella* Hall.
- No area on pedicle valve
  - non plicate; *Leioproductus* Stainbrook, n. gen.
  - Front portion plicate; *Avonia* Thomas.

Spines present on both valves; an undiagnosed Mississippian genus.

Discussion.—The Productellinae form a small but closely related group generally with smooth shells, strong erect spines and posterior concentric growth wrinkles. The ancestral type, *Productella*, is well developed in the Devonian and numerous species evolved during the later part of that period. This genus does not appear to have survived the Devonian. Mississippian representatives of the subfamily have lost the cardinal areas and one genus, *Avonia*, has developed plications on the front half of the shell. This genus probably was not derived from the same stem that produced the costate Productinae as the early portion of its shell is quite smooth except for growth wrinkles. Some specimens as *Avonia pyxidata* (Hall) from the Louisiana limestone of Missouri are quite smooth but others even in the species, are moderately plicate.

Subfamily STROPHALOSIINAE Schuchert

Shells noncostate, areas present or absent in one or both valves; Spines long, slender, recumbent, present on both valves or on pedicle valve alone, bases generally elongate.

Spines present on both valves
- Areas present:
  - *Eostrophalosia* Stainbrook (Devonian forms)
  - *Strophalosia* King (Permian forms)
- Areas not present;
  - *Pustula* Thomas
  - *Echinoconchus* Thomas
  - *Krotovia* Fredericks

Waagenoconcha Chao
Juresania Fredericks
Spines on pedicle valve only
Area on pedicle valve:
Heteralosia King
Leptalosia Dunbar and Condra
No area on pedicle valve:

PLANOPRODUCTUS Stainbrook, n. gen.
BISPINOPRODUCTUS Stainbrook, n. gen.

Discussion.—Several of these genera, *Pustula*, *Echinoconchus*, *Krotovia*, *Waagenoconcha* and *Juresania*, were included by Schuchert and Le Vene in the subfamily Productinae. They are here placed in the Strophalosiinae for several reasons. First, they are non-costate; spines are present on both valves and differ in character from those of the Productinae, being generally recumbent on the surfaces of the valves more like those of *Strophalosia*. In these characters they differ wholly from the costate Productinae. Secondly, the Strophalosiinae almost certainly descended from *Strophalosia* (*Eostrophalosia*) of the Upper Devonian. The possibility that genera with spines similar to those of *Strophalosia*, but present only on the pedicle valve might constitute a separate subfamily however, is not precluded. In the Middle Devonian Hamilton of Ontario a *Leptalosia* occurs that has well developed cardinal areas, spines and a distinct attachment scar on the pedicle valve and smooth brachial valve. This may be ancestral to *Heteralosia* and *Leptalosia* and suggests that the strophalosioids with spines on both valves may have descended from a different ancestor.

Subfamily PRODUCTINAE Waagen.

Shell costate with relatively few coarse erect spines on the pedicle valve, spines rare on brachial valve, areas rarely present, growth wrinkles present or absent. (Secondarily non-costate forms included.)
Spines on pedicle valve only:
Productus Sowerby
Dictyoclostus Muir-Wood
Marginifera and others
Spines on both valves:
Buxtonia Thomas

Of the productoid genera present in the Upper Devonian, namely *Productella*, *Strophalosia*, *Leptalosia*, and *Devonoproductus*, only the last seems to fulfill the requirements of the ancestral stock of the Productinae. Its pedicle valve is completely costate; its brachial valve has growth laminae strongly developed but these are generally crossed by plications, especially toward the front. Concentric growth wrinkles occur in the angles. Internally, ridges outline the visceral region of the pedicle valve and a trail is probably initiated. The spines are relatively few, scattered, coarse and erect. None of the other Devonian genera, some of which may be ancestral to other productid groups, is completely costate.

The Productinae are sparsely represented in the Percha, only *Buxtonia* having as yet been recognized. Perhaps this group developed somewhat later but more probably its evolution was in process elsewhere.

Subfamily PRODUCTELLINAE
Schuchert and Le Vene
Genus LEIOPRODUCTUS
Stainbrook n. gen.

Small to medium sized productids, highly concavo-convex, valves similarly curved but enclosing considerable space, pedicle valve strongly arched from beak to front with curvature greatest over umbo. Median sulcus usually present, may be occupied by single broad low plication or may be nearly obsolete. Surface arched strongly from midline to sides and posteriorly, depressed toward cardinal angles which may be developed as ears. Umbo large, convex, projecting beyond hingeline; beak small, curved, extending over hingeline. Cardinal area not present or linear. Hingeline straight, equal or less than greatest width. Interior unknown.

Brachial valve deeply concave in middle and toward front, elevated near cardinal angles. Umbo and beak concave. Area absent or linear. Cardinal process small, bifid extending posteriorly in plane of valve; its lobes closely approximated, separated by groove; each lobe grooved on the posterior surface, most deeply at posterior end. Sockets not observed, probably absent, Base of cardinal process continues forward as three ridges; lateral ridges broad, forming postero-

lateral borders of muscle area, ending abruptly about midway along sides of scars; median ridge broad at first, sulcate, narrowing toward front, almost disappearing at anterior border of muscle scar but continuing as low thin septum which terminates near midpoint of valve. Muscle area flabellate, not strongly impressed in genotype. Internal surface broadly and gently convex in visceral region, strongly geniculate toward front and lateral margins. Boundary of visceral area indistinct, marked by no structure. Internal surface generally smooth but corrugated by discontinuous concentric wrinkles most pronounced on lateral portions; scattered pustulose projections present on geniculate part.

Exterior of both valves marked on posterior half by numerous rounded to angular growth wrinkles, variable in size and continuity, most pronounced near hingeline and angles, usually obsolete in the middle of valve. Spine bases present on pedicle valve only, large, circular, seldom if at all elongated, generally few in number, irregularly arranged as a rule, occasionally with a median linear series. Spines long, strong, circular in section, erect, never recumbent on surface of shell.

Leioproductus differs from *Productella* in lacking areas in both valves, in having teeth and sockets absent or nearly obsolete and in its more strongly concavo-convex shell. From *Strophalosia* it differs in having spines few in number and of a different type only on the pedicle valve and no cardinal areas. From *Heteralosia* it may be distinguished by the lack of cardinal areas and by the different type of spines. *Leioproductus* is near *Plicatifera* Chao but differs in having a median sulcus in the pedicle valve and less strongly developed concentric wrinkles.

In size and shape *Leioproductus* is similar to *Marginifera* but lacks radial costae and the internal character of the brachial valve is different. From other members of the Productinae it is readily distinguished by its lack of radial costae.

The genotype is *Productella plicata* Kindle described as a variety of *P. coloradensis*. The genus is known only from the Percha shale

LEIOPRODUCTUS COLORADENSIS (Kindle)
Plate 46 figures 18–20

Productella semiglobosa, Girty, 1900, U.S.G.S. 20th Ann. Rept., pt. 2, p. 42, pl. 3, figs. 7–10.
—— *coloradensis*, Kindle 1909, U.S.G.S. Bull. 391, p. 17, pl. 4, figs. 2–8.

This species is similar in size and form to members of the genus *Marginifera* but lacks radial costae. It is characterized by the strongly convex pedicle valve generally with a median sulcus but this feature may be weakly developed. Spine bases are few and scattered. Growth wrinkles occur on the posterior halves of both valves but seldom continue across the umbo. Surface between spine bases smooth.

A typical hypotype measures 17.4 mm. in length, 18.7 mm. in width and 11.4 mm. in convexity. A sulcate hypotype is 14.1 mm. long, 16.5 mm. wide and 11.4 mm. in thickness.

Occurrence.—Percha formation, Bella member near Hillsboro, New Mexico where it is less abundant than *Leioproductus plicatus* (Kindle); east side San Andres Mts. near east end of Rhodes' Pass, New Mexico; several poorly preserved specimens from Mr. Martin, near Bisbee, Arizona.

Types.—Hypotypes, M. A. S. 1606, 1608.

LEIOPRODUCTUS PLICATUS (Kindle)
Plate 46, figures 21–23

Productella coloradensis var. *plicatus*, Kindle, 1909, U.S.G.S. Bull. 391, p. 18, pl. 4, figs. 9–12.

In size, shape and most other features this species is similar to *Leioproductus coloradensis* but a distinct broad median plication is apparently persistent on the pedicle valve and furnishes a ready means of separation. It also bears a single median row of large spines, which is characteristic and recognizable even if the plication be poorly developed.

Two typical hypotypes measure 16.1 mm. and 14.8 mm. in length, 16.5 mm. and 18.2 mm. in width and 10.2 mm. and 9.6 mm. in thickness.

Occurrence.—Percha formation, Bella member at Hillsboro and east side of San Andres Mts., near east end of Rhodes' Pass, New Mexico.

Types.—Hypotypes M. A. S. 1607.

Genus AVONIA Thomas

AVONIA DEFESSA Stainbrook n. sp.

Plate 46, figures 6–7

Shell small, productoid, strongly concavo-convex, subquadrate in outline, wider than long, broadest at midlength with hingeline shorter than greatest width. Measurements of holotype and a paratype are: length 12.1 mm. and 10.8 mm.; width 14.1 mm. and 13.1 mm.; thickness 7.5 mm. and 7.4 mm.

Pedicle valve strongly arched from beak to front, highest at midpoint. Surface flattened in central part, sloping abruptly to antero- and postero-lateral margins, less rapidly to front. Median sulcus broad, shallow, apparent only in front portion of valve. Lateral slopes nearly vertical to plane of valve, slightly concave near hingeline. Umbo low, narrowly convex, projecting posteriorly. Beak small, pointed, incurved; area not apparent. Interior unknown.

Brachial valve deeply concave, nearly parallel to other valve, deepest centrally and in broad area extending toward front. Surface abruptly upturned to front and lateral margins, concave in umbonal region, elevated toward angles. Interior unknown.

Surface of pedicle valve marked by numerous small irregularly scattered spine bases. Spines apparently circular, hollow and erect with bases not elongated, rising from short costae on anterior half near margin. Posterior half of valve marked by a few growth wrinkles, stronger at sides, generally obsolete medially. Anterior half of valve marked by rounded plications; near middle these may be short and broken but at front they are longer and more continuous, some may extend nearly one-third length of valve. Brachial valve without spines but concentric growth wrinkles are present as in other valve and a few short plications occur near front margin.

Avonia defessa resembles *A. concentrica* (Hall) and *A. pustulifera* (Moore) but differs in shape, in the stronger expression of the plications and in the presence of a sulcus in the pedicle valve. It also resembles some species of *Marginifera*.

Occurrence.—Percha shale, Bella member at Hillsboro, New Mexico.

Types.—Holotype M. A. S. 1612 A; paratypes M. A. S. 1612.

Subfamily STROPHALOSIINAE Schuchert

Genus HETERALOSIA King 1928

HETERALOSIA NUPERA

Stainbrook, n. sp.

Plate 46, figures 16–17

Shell of medium size or larger, depressed concavo-convex, subquadrate to subcircular in outline with broadly rounded antero-lateral margins, broadest at middle or a little anteriorly, hingeline straight and less than greatest width. Measurements of holotype and of a paratype are: length 21.5 mm. and 23.4 mm.; width 24.1 mm. (incomplete) and 32.5 mm.; depth of pedicle valve 6.4 mm. and 12.3 mm.

Pedicle valve moderately to gently convex, highest centrally. Surface sloping gently along midline toward front, more rapidly to lateral margins, most strongly to cardinal margins; depressed on either side of umbo and toward cardinal angles. Umbo broadly convex, continuous with equally elevated middle portion of valve which expands slightly toward front. Beak small, in paratype displaying a broad flat scar of attachment, the latter less distinct in holotype. Cardinal area moderately well developed, flat, in plane of valve, highest beneath beak and becoming lower very gradually toward cardinal angles. Delthyrium high, narrow, completely covered by a strongly convex deltidium. Spines long, slender, recumbent on surface, scattered with general tendency to arrangement in series parallel to growth lines, more common toward front. Surface smooth between spine bases which are small, narrow, posteriorly elongated.

Brachial valve shallowly concave, deepest centrally and toward front, elevated at cardinal angles. Beak small, umbo concave. Cardinal area about half as high as in other valve, lying at a broadly obtuse angle with it, divided by a broad low chilidium. Surface apparently smooth, no spines or spine bases observed, marked by fine concentric growth lines. No wrinkles present on either valve.

The large size, depressed convexity and fewer spines distinguish this form from such Mississippian species as *H. orbiculata* (Hinchey and Ray), *H. cymbula* (Hall and Clarke), *H. subelliptica* (Hinchey and Ray), *H. fortispinosa* (Hinchey and Ray) and *H.*

beecheri (Rowley). The large size, depressed convexity and lack of spines on the brachial valve distinguish it from such Upper Devonian species as *Strophalosia rockfordensis* Hall and Clarke from the Lime Creek shale of Iowa and *S. callawayensis* (Swallow), from the Snyder Creek shale of Missouri.

Occurrence.—Percha formation, Bella member, near Hillsboro, New Mexico.

Types.—Holotype M. A. S. 598 A; paratypes M. A. S. 598.

PLANOPRODUCTUS Stainbrook, n. gen.

Shells medium to large, depressed concavo-convex, pedicle valve slightly more curved than brachial, subquadrate in outline, wider than long, greatest width at about midlength, hingeline shorter than greatest width.

Pedicle valve depressed convex, highest near midpoint, surface sloping equally toward front and lateral margins, depressed on each side of umbo and toward angles. Umbo small, convex, a little projecting, Beak small, pointed, slightly incurved. No area visible.

Brachial valve gently concave, depressed centrally and posteriorly toward beak, surface rising gradually to front and lateral margins, elevated slightly in the areas enclosed by cardinal angles. Cardinal process small, bifid, posteriorly projecting nearly in plane of valve, each lobe externally grooved. Median septum thin, low, tenuous, extending from base of cardinal process forward to or beyond the center of valve. Muscle area not strongly impressed. Anterior portion of internal surface marked by numerous elongate pustules, largest near margins where they resemble spines.

Externally spines present only on pedicle valve, abundant, moderately long, acutely pointed, tending to parallel or lie on surface, no consistant pattern noted, locally arranged nearly in quincunx, elsewhere in concentric rows. Spine bases small, elongate anteroposteriorly over most of surface; several hypotypes with one or more medial rows not elongated but circular, suggesting that these spines stood erect. Growth wrinkles abundant, concentric, somewhat discontinuous, low, broadly convex, separated by much narrower furrows, generally bearing the spines, occurring over entire surface of both valves but may be less prominent toward front.

The genotype is *Productella hillsboroensis* Kindle. This genus is distinguished from *Strophalosia* by the absence of cardinal areas and spines on the brachial valve and by the presence on the pedicle valve of a median series of more or less erect spines which differ from those on the slopes.

It may be separated from *Pustula* and *Echinoconchus* by the smooth brachial valve and different arrangement of spines on the pedicle valve. It attains a much larger size than *Leioproductus*, is a much more depressed shell and has more numerous, differently shaped strophalosioid spines bases on the lateral slopes.

It is distinguished from *Heteralosia* by larger size, flatter shell, greater development of growth wrinkles, possession of two types of spines bases and by the absence of cardinal areas.

The strophalosioid spines of *Planoproductus* indicates that this genus should be assigned to the Strophalosiinae rather than the Productellinae.

PLANOPRODUCTUS HILLSBOROENSIS (Kindle)
Plate 46, figures 27–29

Productella hillsboroensis, Kindle 1909, U.S.G.S. Bull. 391, p. 19, pl. 5, fig. 6.

Fifteen specimens of this species, none complete, show a few features not mentioned in the original description. The best preserved hypotype apparently measured about 33.5 mm. in length, 44 mm. in width and 9.8 mm. in thickness.

Pedicle valve highest near center, surface sloping about equally toward front and lateral margins, depressed on either side of beak and toward cardinal angles. Umbo small, projecting slightly; beak small, slightly incurved over hingeline. No area apparent.

Brachial valve not quite parallel to opposite valve, deepest near center, elevated toward cardinal angles. Interior as indicated in generic description.

Surfaces of both valves marked by numerous narrow concentric wrinkles of growth, more or less irregular but nearly continuous. Spines on pedicle valve long, slender, acutely pointed, lying on or parallel to surface; bases elongate, narrow, irregularly scattered with

no definite arrangement, sometimes in short series parallel to growth lines. One or more medial rows of circular spine bases present on pedicle valve of most specimens.

Surface of brachial valve smooth except for growth striae and wrinkles; latter less continuous than on opposite valve, shorter and with numerous shallow dimples between.

The large size, low convexity of pedicle valve, shallow brachial valve, lack of cardinal areas, presence of medial series of circular spine bases on pedicle valve and abundant growth wrinkles are distinctive of this species. The strophalosioid spines and noncostate surface ally this species with the Strophalosiinae.

Occurrence.—Percha formation, Bella member, at Hillsboro, New Mexico.

Types.—Hypotypes M. A. S. 1590.

Genus BISPINOPRODUCTUS Stainbrook, n. gen.

Shells of medium size, productoid, strongly concavo-convex, subquadrate in outline, hingeline equal or less than greatest width which is usually anterior to mid-length.

Pedicle valve strongly and regularly arched from beak to front, curvature greatest posteriorly, least strong transversely, flattened centrally with sides nearly vertical. Median portion depressed, with sulcus beginning on umbo and extending to front, bottom rounded, sides merging gradually with lateral slopes. Umbo broad, low, depressed, often greatly extended beyond hingeline. Beak small, area linear. Surface marked by fine concentric wrinkles of growth, most prominent on cardinal angles, rarely extending across middle, scarcely visible on front portion. Spine bases numerous, small, elongate, higher anteriorly, scattered, tending to form concentric series paralleling wrinkles. Spines fine, slender, generally recumbent or parallel to surface but on the ears some may be erect; single medial row of three to ten spines, apparently circular and erect, several times larger than those on slopes, generally situated on large elongate bases which simulate a plication n sulcus; interior unknown.

Brachial valve less curved than pedicle, concave, flattened centrally and toward umbo, elevated toward cardinal angles, strongly geniculate on front and lateral margins. Surface spineless, marked by scattered small shallow dimples, and posteriorly by fine concentric growth wrinkles more or less obsolete medially. Interior with fine thin median septum and numerous concentric wrinkles toward cardinal angles and sides, smooth elsewhere. Cardinal process small, short, bifid. The genotype is *Bispinoproductus varispinosus* Stainbrook n. sp.

This genus has somewhat mixed features but the small generally recumbent spines and fine elongate spine bases apparently ally it with the Strophalosiinae. It differs from *Strophalosia* in the lack of spines on the brachial valve and absence of cardinal areas. The lack of areas, and the presence of a medial series of very large spines on the pedicle valve distinguish it from *Heteralosia*. The absence of spines on the brachial valve differentiates it from *Krotovia*, *Echinoconchus* and *Pustula*. The smaller size, greater concavo-convexity and the median series of spines in the sulcus distinguish it from *Planoproductus*.

BISPINOPRODUCTUS VARISPINOSUS Stainbrook, n. sp.

Plate 46, figures 30–33

Productus coloradensis var. *plicatus*, (part) Kindle, 1909, U.S.G.S. Bull. 391, pl. 4, fig. 13, (not figs. 9, 10, 10a, 11, 11a).

Shell above medium size, strongly concavo-convex, subquadrate in outline with auriculate cardinal angles, apparently broadest toward front, hingeline less than greatest width. Holotype (with anterior slightly crushed) measures 21.1 mm. in length (restored), 26.8 mm. in width and 10.1 mm. in thickness. A paratype is 23.9 mm. long, 27.4 mm. wide (restored), and 14.1 mm. in thickness.

Pedicle valve strongly and regularly convex from beak to front, highest near midpoint; surface more or less depressed along midline, developing broad shallow sulcus with indistinct borders toward the front; remainder broadly convex from umbo to antero-lateral margins, descending abruptly toward lateral borders, depressed at cardinal angles. Umbo broadly convex, prominent, projecting beyond hingeline. Beak small, projecting; area linear. Interior unknown.

Brachial valve strongly concave, tending

to parallel opposite valve but leaving considerable internal cavity, deepest near center and in umbonal region, curving upward abruptly toward front and lateral margins, elevated near cardinal angles. Interior generally flat or gently convex in visceral region, strongly geniculate beyond. Cardinal process small, bifid; lobes low, excavate posteriorly. Hinge sockets apparently absent. Concentric ridges and short radially elongate elevations reflect external growth wrinkles and depressions.

Growth wrinkles common on exterior of pedicle valve, generally continuous, more numerous and prominent on posterior half; growth striae also abundant. Narrow, discontinuous plication-like ridge, variable in strength in different specimens, usually present in sulcus from umbo to front, and formed by several large conjugate bases. On inner slopes beyond sulcus three to ten median rows are two to three times as large as those beyond and probably bore erect spines. Spine bases on outer slopes abundant, small, tending to be arranged in concentric rows on or parallel to growth wrinkles, elongated, about one millimeter in length; spines small, generally oblique, sometimes recumbent, may be erect on ears.

Exterior brachial valve without spines, marked by numerous strong concentric growth wrinkles, especially prominent near cardinal angles, and slightly elongate dimples which appear to correspond to spines on opposite valve.

The geniculate brachial valve without spines, lack of cardinal areas, and presence of two series of large erect, and small recumbent spines in pedicle valve are distinctive features.

Occurrence.—Percha formation, Bella member at Hillsboro, New Mexico.

Types.—Holotype M. A. S. 1597 A; paratypes M. A. S. 1597.

Genus PUSTULA Thomas

PUSTULA PRAECEDENS Stainbrook, n. sp.
Plate 46, figures 24–26

Productella spinigera, (part), Kindle, 1909, U.S.G.S. Bull. 391, pl. 5, fig. 26.

Shell of medium size or larger, wider than long, moderately concavo-convex, subquadrate in outline with rounded antero- and postero-lateral margins, broadest at midlength; hingeline apparently considerably less than greatest width. Measurements of holotype and a paratype are: length 18.4 mm. and 16.4 mm.; width 21.7 mm. and 20.3 mm.; thickness 7.9 mm. and 6.6 mm.

Pedicle valve moderately convex, gently arched from umbo to front, more strongly to beak, highest posterior to midlength. Surface elevated in zone which gradually widens from umbo to front, gently convex or slightly depressed along midline, sloping rapidly to lateral margins, depressed toward angles. Umbo high, narrowly convex, extended beyond hingeline. Beak small, pointed, projecting, incurved. No area apparent; interior unknown.

Brachial valve considerably less concave than pedicle, nearly flat, deepest in umbonal region, depressed in narrow zones extending thence to antero-lateral margins, median anterior portion slightly elevated in zone widening toward front, elevated near cardinal angles and posterolateral margins. Interior unknown.

Exterior of shell marked by numerous low growth wrinkles, narrow and fairly regular, more or less in form of asymmetrical bands with much steeper forward slopes. Spine bases numerous, elongate, scattered, irregularly arranged in posterior portions but toward front tending to occur in concentric series of single rows. One specimen possesses short radiating ridges toward front of pedicle valve which gives it a pseudo-costate appearance. Surface of brachial valve similar to that of pedicle but may also have more or less dimpled appearance.

The asymmetrical growth wrinkles and concentrically arranged spine bases are not as conspicuously developed as in later species but are characteristic of the genus *Pustula*.

This species resembles *Krotovia praecursor* superficially but has a more convex pedicle valve, fewer spines which are differently arranged, and moderately conspicuous concentric bands which are not characteristic of *Krotovia*.

Horizon.—Percha formation, Bella member, near Hillsboro, New Mexico.

Types.—Holotype M. A. S. 1610 A; paratypes M. A. S. 1610.

Genus KROTOVIA Fredericks
KROTOVIA SPINIGERA (Kindle)
Plate 46, figures 8–10

Productella spinigera, Kindle, 1909, U.S.G.S. Bull. 391, p. 19, pl. 5, figs. 1, 1a, 2, 2a, 3.

Of two specimens the best preserved measures 13.4 mm. in length, 12 mm. in width and 5.4 in thickness; the other is slightly larger.

In his description Kindle mentioned two kinds of specimens, one with and the other without strong lamellae of growth. Spines are arranged more concentrically on the first than on the second and because of these characters I have referred specimens of this type to *Pustula* and described them as the foregoing new species. I am also restricting Kindle's name to specimens of the second type and referring them to *Krotovia* because of the scattered arrangement of the spines.

Because of the absence of an area in either valve and the presence of spines of a different type on the brachial valve this species cannot be retained in *Productella*.

Occurrence.—Percha formation, Bella member, at Hillsboro, New Mexico.

Types.—Hypotypes M.A.S. 1599.

KROTOVIA PRAECURSOR Stainbrook, n. sp.
Plate 46, figures 11–15

Shell of medium size, depressed concavo-convex, subquadrate in outline slightly wider than long, broadest at middle, hinge-line less than greatest width, cardinal angles rounded. Dimensions of holotype and of a paratype are: length 18.9 mm. (restored) and 20.3 mm.; width 21.2 mm. (restored) and 24.4 mm.; depth of pedicle valve 5.5 mm. and 5.8 mm.

Pedicle valve gently convex, highest in umbonal region. Surface elevated from beak to front in zone enclosed by lines extending from beak to antero-lateral margins where it becomes flat or gently convex; sloping abruptly from these lines to lateral margins, depressed toward cardinal angles; anterior parts of some specimens depressed into broad shallow sulcus. Umbo low, gently arched from beak toward front, more strongly arched transversely, narrowing rapidly backward. Beak pointed, incurved, extended slightly over hingeline; no area visible. Interior unknown.

Brachial valve very gently concave, nearly flat, deepest in umbonal region, flattened centrally and in zone expanding toward front, elevated slightly toward cardinal angles and lateral margins. Cardinal process bifid, each lobe grooved posteriorly; other internal features unknown.

Exterior of both valves marked by numerous concentric growth wrinkles, narrow, somewhat irregular, nearly continuous; fine striae abundant also. Spine bases numerous, small, elongate longitudinally, rounded at summit, higher anteriorly, radially arranged with considerable regularity but not in well developed concentric bands, almost in quincunx, except near front margin. Spines about two millimeters long, slender, acutely pointed, projecting laterally and anteriorly, lying on surface of valves. Numerous dimples also present on brachial valve, somewhat elongate, slightly irregular in arrangement, with spine bases and growth wrinkles producing characteristic appearance.

This species differs from *K. spinigera* (Kindle) in being two to three times larger, differently shaped with width greater than length, in having a proportionately more depressed pedicle valve, spines on pedicle angles less erect, and elongate spine bases.

The nearly quincunxial arrangement of the spines and the medial flattening or sulcus of the pedicle valve might indicate that this species should be assigned to *Waagenoconcha*, but that genus is reported only from the Permian.

Occurrence.—Percha formation, Bella member at Hillsboro, New Mexico.

Types.—Holotype M.A.S. 1609 A; paratypes M.A.S. 1609.

Genus ECHINOCONCHUS Weller

This genus of the Strophalosioids includes non-costate, nongeniculate shells with cardinal areas poorly developed or absent and numerous fine spines on the exterior of both valves. It is further distinguished by concentric bands of spines, two rows to each band. One species, *Productella laminata* Kindle possesses all these characters and is apparently one of the earliest members of this genus.

ECHINOCONCHUS LAMINATUS (Kindle)
Plate 46, figures 3–5

Productella laminatus, Kindle, 1909 U.S.G.S. Bull. 391, p. 18, pl. 4, figs. 13–14.

Of four specimens, all are more or less incomplete or partially embedded in matrix. The largest measures 17.1 mm. in length and about 19 mm. in width. A small but more complete example is 12.2 mm. long, 13.1 mm. wide (restored) and 5.7 mm. in thickness.

Pedicle valve moderately convex but slightly concave medially. Beak small, incurved over hingeline. Area apparently linear. Concentric bands or growth wrinkles mentioned by Kindle are most distinctive features, 12 present on one specimen, about 20 on another, about one millimeter wide, asymmetrical, forward slope more abrupt. Double series of spine bases present on each band, front ones smaller and somewhat more numerous, rear ones longer, farther apart, extending posteriorly nearly to the edge of other series. Spines fine, at least three or four millimeters long, parallel to or recumbent on surface of valve. Bands less prominent, spines less numerous and less definitely arranged in a double series on brachial valve.

Occurrence.—Percha formation, Bella member, at Hillsboro, New Mexico.

Types.—Hypotypes M.A.S. 1588.

Subfamily PRODUCTINAE Waagen
Genus BUXTONIA Thomas
BUXTONIA SINGULARIS Stainbrook, n. sp.
Plate 46, figures 1–2

Shell small, nearly plano-convex, subquadrate in outline, lateral and anterior margins gently rounded or nearly straight, hingeline less than greatest width which is anterior to midlength. Holotype 17.1 mm. long, 20.1 mm. wide and 6.9 mm. in thickness.

Pedicle valve moderately convex, highest near midpoint, regularly arched along midline; median portion of valve elevated from umbo to front in gradually widening zone, slightly depressed centrally by indistinct median sulcus. Surface sloping steeply from median elevated portion to postero-lateral margins and on each side of beak. Umbo low, broadly convex, slightly projecting. Beak small, very slightly curved. Area linear; interior unknown.

Brachial valve nearly flat, slightly depressed in umbonal region and in front of cardinal margin. Interior unknown.

Exterior of both valves marked by numerous radiating acutely angular costae, moderately strong, slightly irregular in width, separated by somewhat broader furrows, three in space of two millimeters at front, rendered slightly nodose by spine bases. Faint concentric growth wrinkles, chiefly on pedicle valve also contribute to a nodose appearance of costae. Spines not well preserved, several near the angles strong, erect, circular in cross section.

Two specimens, one complete, occurred with other typical Percha fossils. This species is the only completely costate productid in the fauna and sole representative of the Productinae.

Occurrence.—Percha formation, near east entrance of Rhodes' Pass, San Andres Mts., New Mexico.

Types.—Holotype M.A.S. 1611; paratype 1611A.

Order TELOTREMATA Beecher
Superfamily RHYNCHONELLACEA Schuchert
Family RHYNCHONELLIDAE Gray
Genus CAMAROTOECHIA Hall and Clarke
CAMAROTOECHIA SOBRINA Stainbrook, n. sp.
Plate 47, figures 19–22

Camarotoechia contracta (Hall) ?, Kindle 1909, U.S.G.S. Bull. 391, p. 22, pl. 6, figs. 1–2a.

Shell small, subtriangular in outline, length less than width, broadest anterior to midlength, thickest slightly posterior to front. Measurements of holotype and a paratype are: length 10 mm. and 11.1 mm.; width 12.3 mm. and 14 mm.; thickness 7.9 mm. and 7.9 mm.

Pedicle valve strongly curved in half circle from beak to front along midline, gently convex transversely in posterior half. Surface flattened centrally, rising from midpoint to anterolateral margins near edge of valve, compressed on each side of beak. Sulcus originating near midpoint, widening and deepening toward front, gently concave at bottom, continued anteriorly as broad linguiform extension. Umbo narrow, gently arched from beak toward front, more convex transversely. Beak long, pointed, but little curved. Cardinal area low, triangular, divided by large delthyrium whose lower part is covered by deltidium of two plates

strongly convex toward brachial valve. Upper end of delthyrium remains open as oblong foramen encroaching on beak. Lateral slopes of valve gently arched posteriorly, concave toward antero-lateral margins. Two lateral septa present internally as in other representatives of genus.

Brachial valve strongly convex, moderately arched on beak and umbo, more gently from there to front, strongly curved transversely, highest at or near front. Fold beginning at midpoint, increasing in width and height to front where it is sharply elevated above remainder of valve. Umbo broad, low, with shallow narrow sulcus becoming obsolete toward midpoint. Beak small, concealed by beak of other valve. Lateral slopes strongly arched from back to front, gently curved from fold to antero-lateral margins, abruptly sloping from umbo to hingeline. Divided internal hingeplate supported by a median septum.

Radial plications about 16, strong, angular at summit, extending from beak to front and lateral margins; three to five, generally four, on fold of brachial valve, sharply elevated at front margin, two to four larger plications on each lateral slope, two or three smaller ones on cardinal angles; generally three plications in sulcus of pedicle valve.

This species generally has been identified as *Camarotoechia contracta* Hall but judging from Hall's illustrations and description of that form, this is no more related to it than are other members of the genus with four plications on the fold. This species appears to differ in size, shape, contour of the sulcus and in that the plications of the brachial valve turn upward strongly at the front and on the antero-lateral margins of the pedicle valve as well. It is one of the more abundant species in the Percha.

Occurrence.—Percha formation, Bella member, at Hillsboro, New Mexico.

Types.—Holotype, M.A.S. 1594 A; paratypes M.A.S. 1594.

Genus PAURORHYNCHA Cooper 1942

Paurorhyncha, Cooper 1942, Jour. Washington Acad. Sci., vol. 32, no. 8, p. 231.

This genus, founded on *Rhynchonella endlichi* Meek, is characterized by its large size, strongly developed sulcus which half divides the brachial valve and forms a recumbent anterior lingual extension, and strong plications which are preserved on internal molds. It is similar to *Camarotoechia* internally, having a median septum in the brachial valve extending forward more than one-third the length of the valve, dental lamellae in the pedicle valve and one beak covering the other. A form shorter than the type from the Ouray limestone occurs in the Percha formation and is here described as a new species.

PAURORHYNCHA COOPERI Stainbrook, n. sp.

Plate 47, figures 1–5

Camarotoechia endlichi (part), Kindle 1909, U.S.G.S. Bull. 391, pl. 6, figs. 11, 11a; pl. 7, figs. 1, 2.

Shell above medium size, subpentagonal in outline, long straight postero-lateral margins meeting at the beak in angle of slightly more than 90°, short rounded antero-lateral margins, straight front margin, width greater than length, broadest anterior to midlength, about as thick as long, anterior commissure strongly sinuate in middle. Dimensions of holotype and a paratype are: length 29.4 mm. and 30.8 mm.; width 39.1 mm. and 37.4 mm.; thickness 29.6 mm. and 33.1 mm.

Pedicle valve strongly arched along midline from beak to front, most strongly at middle, gently curved anteriorly and posteriorly. Surface mostly flattened posteriorly, a line drawn from beak to antero-lateral margin being nearly straight except at front, elevated slightly in umbonal region. Median sulcus beginning well up on umbo, widening and deepening to front, broad, gently concave at bottom, deepest at midlength, anterior part greatly extended, forming quadrate lingual extension which is recumbent and produces emargination in opposite valve. Lateral parts of valve small, slopes narrow, inner portions flattened and upturned at front, lateral portions abruptly deflected toward opposite valve, forming flattened lateral rim externally. Umbo small, narrow, convex in middle. Beak small slightly projecting, incurved, bearing a small foramen generally nearly concealed. Two short internal dental lamellae; muscle scars on mold elongate oval, radially grooved, moderately incised.

Brachial valve moderately arched along midline, more strongly so over umbo, greatly arched transversely, highest at an-

terior commissure a little in front of midpoint. Fold originating on umbo, broadly convex, low at first, gradually increasing in width and height to front, shortened by lingual extension of opposite valve, flattened to gently convex on summit, sides abruptly deflected toward lateral slopes. Umbo broad, low, gently convex; beak small, concealed. Lateral slopes curving abruptly from fold to lateral margins, slightly concave above cardinal margins on either side of beak; middle portions elevated to form narrow convex ridge extending from beak to antero-lateral margin. Strong median septum extends forward about half length of valve, bears short v-shaped trough beneath divided hingeplate.

Surface of both valves plicate except beaks which are smooth. Plications small, narrow, closely aggregated on posterior portions of shell, broad, low, gently convex anteriorly, separated by narrower grooves, increasing by division; number variable, and ranging from five to seven large ones on summit of fold with four lower and smaller ones on sides; five or six lower narrower less prominent plications on slopes become nearly obsolete at front and postero-lateral margins. Plications similar on pedicle valve, four to six large ones in bottom of sulcus, several lower ones on sides which become several times broader toward front; those on lateral slopes as on opposite valve. Growth striae numerous, one or two may be prominent.

This species differs from *P. endlichi* in that it is smaller, differently shaped, considerably shorter and has fewer plications which are broader at the front.

Occurrence.—Percha formation, Bella member, at Hillsboro and Kingston, New Mexico; Mt. Martin near Bisbee, Arizona.

Types.—Holotype, M. A. S. 1603 A; paratypes M.A.S. 1603, 1621.

Genus PARAPHORHYNCHUS Weller

Paraphorhynchus, Weller 1914, Ill. Geol. Surv., Mono. 1, p. 187.

This genus is composed of medium sized rhynchonelliform shells with well developed fold and sulcus, strong plications, more or less round at the top and generally not reaching the beaks and fairly smooth umbonal regions in both valves. Fine radiating costae mark the sides of the plications and furrows and these with the smooth beaks distinguish members of the genus from species of *Camarotoechia*. Internal structure same in both genera.

The species described below was identified by Kindle as *Pugnax pugnus* but cannot be referred to that genus as it has a strong median septum in the brachial valve not present, as shown by Weller, in that species. Other features and its fine costae demonstrate its relations to *Paraphorhynchus*.

PARAPHORHYNCHUS PERCHAENSIS
Stainbrook, n. sp.
Plate 47, figures 6–13

Pugnax pugnus, Kindle 1909, U.S.G.S. Bull. 391, pp. 22–24, pl. 6, figs 3–8a.

Shell rhynchonelloid, below medium size, subtriangular in outline with slightly concave postero-lateral margins which form a broadly obtuse angle at beaks, lateral margins broadly rounded, front margin nearly straight, wider than long, broadest near midlength, short for a member of this genus. Dimensions of holotype and of two paratypes are: length 14.2 mm., 15 mm. and 17.3 mm. (restored); width 19.2 mm., 23.1 mm. and 26.1 mm.; thickness 14.6 mm., 16.8 mm. and 19.4 mm.

Pedicle valve strongly and regularly arched in semicircle along midline, gently arched transversely in posterior. Surface nearly flat on lateral slopes, slightly concave on each side of beak, line from beak to middle of side of sulcus nearly straight. Sulcus originating on umbo, becoming wider and much deeper toward front, gently rounded at bottom, deepest at midlength, shallow anteriorly; anterior portion greatly projecting, forming linguiform extension truncating middle of opposite valve, lying at right angles to plane of valve. Lateral slopes small, may be slightly concave near antero-lateral border. Umbo small, low, convex along median line. Beak small, projecting but little, slightly incurved, concealing opposite beak, pierced by an oblong terminal foramen. Two short dental lamellae present in apical portion of interior of valve.

Brachial valve gently and regularly arched from beak to front, strongly arched transversely. Fold strongly developed, beginning on umbo, rising toward front,

truncated by opposite lingual extension, moderately elevated above remainder of valve. Lateral slopes abruptly arched from fold to lateral margins and from back to front, slightly concave from beak toward angles. Umbo broad, low, flattened or slightly depressed along summit; beak concealed. Slightly concave hingeplate supported by a short median septum present in beak.

Surface of both valves strongly plicate except umbones and beaks. Plications strong, narrow, angular on summits especially near front, subangular to rounded posteriorly; generally three in sulcus of pedicle valve but some specimens have additional small plications on sides, and four on each lateral slope; plications bordering sulcus largest and extending to umbo, others short and smaller toward cardinal angles; generally four plications on fold of brachial valve, central pair longer and higher at front, lateral pairs of plications usually united posteriorly; smaller plications may occur on sides of fold, five on each lateral slope may nearly reach umbo. Furrows between plications narrow, rounded at bottom, may become angular toward front. Fine costae present on both plications and furrows extend forward parallel to plications, locally preserved on parts of about half of specimens; growth striae fine, common especially near front.

This species resembles most closely *P. transversum* Weller from the Kinderhook. Although about the same size it is proportionately shorter and, therefore, different in shape.

Occurrence.—Percha formation, Bella member at Hillsboro, New Mexico; Mt. Martin, near Bisbee, Arizona.

Types.—Holotype M.A.S. 1596 A; paratypes M.A.S. 1596, 1727.

Genus SHUMARDELLA Weller

SHUMARDELLA GLABRAVENTRA Stainbrook, n. sp.

Plate 47, figures 14–18

Shell small, subpentagonal to subovate in outline, lateral margins broadly rounded, slightly wider than long, broadest anterior to midlength, anterior commissure strongly sinuate and dentate. Specimens preserved as calcium carbonate are crushed and do not show true thickness. Others preserved in pyrite are uncrushed internal molds. Measurements of the holotype and two paratypes are: length 16.8 mm., 16.1 mm. and 15.2 mm.; width 17.5 mm., 16.7 mm. and 14.9 mm.; thickness 10.8 mm., 9.9 mm. and 11.4 mm. A pyritic internal mold is 11.2 mm. long, 12.3 mm. wide and 10.3 mm. thick.

Pedicle valve gently arched along midline in posterior half, abruptly so to front. Surface of posterior portion moderately arched transversely, slightly flattened centrally, depressed on each side of beak. Line from beak to antero-lateral margin on border of sulcus nearly straight. Sulcus originating on umbo, slightly convex at bottom at first, broader and deeper near midlength, narrow somewhat anteriorly, bottom continued as quadrate linguiform extension which may extend at right angles to plane of valve. Lateral slopes small, curving steeply from borders of sulcus to postero-lateral margins. Beak obtuse, projecting, slightly incurved, pierced by oblong foramen. Two short dental lamellae present internally in apical portion of valve.

Brachial valve more convex than the pedicle, highest at front, arching with regular moderate curvature along midline from beak to front, more strongly arched transversely. Fold strongly developed, elevated considerably above remainder of valve, flattened along the summit, increasing in width and height toward front, shortened by opposite linguiform extension. Umbo broadly convex, flattened, postero-lateral surfaces slightly concave. Beak small, concealed. Lateral slopes descending abruptly from borders of fold to lateral margins, nearly vertical. Strong median septum extends anteriorly for somewhat more than one-third length of valve. Hingeplate, as shown in cross sections of beak, continuous even after septum is detached below.

Surface of shell marked by low broad rounded plications, generally failing to reach umbones, except in sulcus and fold, commonly, three on fold, two in sulcus and three or four on each lateral slope, last may be nearly obsolete on some specimens. Fine growth lines common on well preserved exteriors.

This species resembles *S. missouriensis*

(Shumard) but is smaller, has the sulcus and fold more extended posteriorly and three or four plications on each slope instead of two. It is about the same size as *S. obsolens* Weller but is somewhat thicker, not as smooth, plications are more prominent, the lingual extension of pedicle valve quadrate and strongly dentate, the fold more elevated and plications present on the lateral slopes. It also differs from both in the internal structures of the brachial valve as seen in cross sections.

Occurrence.—Percha formation, near east end of Rhodes' Pass, San Andres Mountains, New Mexico.

Types.—Holotype M.A.S. 1587 A; paratypes, M.A.S. 1587.

Superfamily TEREBRATULACEA Waagen
Family DIELASMATIDAE Schuchert
Genus DIELASMA King
DIELASMA CORIFORME Stainbrook, n. sp.
Plate 47, figures 34–37

Shell small, subequally biconvex, subovate, broadest anterior to midlength, postero-lateral margins long, gently curved and meeting in an obtuse angle, antero-lateral margins about equally long with slight reentrant at middle, front margin short, broadly rounded, anterior commissure straight. Holotype 14.5 mm. long, 12.1 mm. wide and 8.2 mm. thick.

Pedicle valve more convex than brachial, highest on umbo, arching strongly thence toward beak and with moderate rapidity toward front. Middle portion elevated into fold extending from beak to front, broadly convex, bordered at front by short narrow sulci. Umbo strongly convex, narrow, projecting posteriorly. Beak broad, blunt, with large apical foramen. Lateral slopes strongly arched from back to front, curving gently from fold to sides at front, curving abruptly to postero-lateral margins, incurved beneath beak. Interior unknown.

Brachial valve similar in shape to opposite valve but with smaller, and less projecting beak and umbo. Interior unknown.

The size, shape, and distinct fold on each valve distinguish this species.

Occurrence.—Percha formation, Bella member, at Hillsboro, New Mexico.

Type.—Holotype, M.A.S. 1618.

Superfamily SPIRIFERACEA Waagen
Family SPIRIFERIDAE King
Genus CYRTOSPIRIFER Nalivkin
CYRTOSPIRIFER ANIMASENSIS (Girty)
Plate 44, figures 21–24

Spirifer disjunctus var. *animasensis*, Girty 1900, U.S.G.S. 20th Ann. Rept., pt. 2, p. 48, pl. 4, figs. 1–10.
Spirifer whitneyi var. *animasensis*, Kindle 1909, U.S.G.S. Bull. 391, pp. 25–26, pl. 9, figs. 1–3a.

This species is represented by several imperfect examples and one good but incomplete specimen. It is characterized by its small size, extended acute cardinal angles, shortness of shell, high, flat or gently curved cardinal area with margins sloping rapidly from beak to hinge extremities, and slightly twisted beak.

A specimen measures 12.5 mm. in length (incomplete), 29.6 mm. in width (one angle restored), 12.8 mm. in thickness and has an area 9.3 mm. high. A short flat transverse delthyrial plate is present in apex of delthyrium. Plications and furrows are covered externally, where unworn, by abundant small, short, elongate ridgelets which are higher and end abruptly anteriorly. These resemble granules and are present also on outer portions of cardinal area of pedicle valve. They resemble markings of *C. whitneyi* (Hall) but our species differs in having a much higher and flat or slightly concave cardinal area in the pedicle valve.

Occurrence.—Percha formation, Bella member, at Hillsboro, New Mexico.

Types.—Hypotypes M.A.S. 1594.

CYRTOSPIRIFER KINDLEI Stainbrook, n. sp.
Plate 44, figures 1–2, 7–12

Spirifer whitneyi, Kindle 1909, U.S.G.S. Bull. 391, pp. 24–25, pl. 8, figs. 2–5a.

Shell large, strongly and about equally biconvex, subquadrate to subpentagonal in outline, wider than long, generally with greatest width at hingeline, cardinal angles slightly extended and auriculate, lateral margins nearly straight, front margin slightly emarginate, anterior commissure strongly sulcate. Dimensions of holotype and a paratype are: length 33.5 mm. and 35.5 mm.; width 47.9 mm. and 42.8 mm.; thickness 32.3 mm. and 30.4 mm. An average specimen of *Cyrtospirifer whitneyi* (Hall)

is 22.3 mm. in length, 35 mm. in width and 18.4 mm. in thickness.

Pedicle valve strongly convex, highest near middle, arching strongly along middle, more prominently over umbo, curvature most abrupt transversely; two strong ridges form borders of sulcus. Umbo prominent, somewhat compressed laterally, extended posteriorly beyond the hingeline. Beak strong, broad, extended, incurved. Cardinal area large, curved, of nearly same height to extremities, margins sloping with moderate rapidity near beak, then gradually to angles; each lateral half divided into two areas, that nearest delthyrium vertically striated, the other smooth or marked by horizontal striae. Delthyrium an equilateral triangle, apparently almost completely covered by deltidium. Sulcus originating at beak, becoming broader and deeper toward front, bordered laterally by narrow, strongly convex ridges, bottom gently concave, continued at front to form long lingual extension truncating middle of opposite valve. Lateral slopes moderately to gently convex from back to front, inclined steeply and almost uniformly from borders of sulcus laterally, concave in front of cardinal angles which may be auriculate. Internal dental plates high, thin, extended forward along floor of valve nearly to front margin, curving slightly inward anteriorly to enclose muscle area. Immature specimens have short flat delthyrial plate sunken a little below surface of cardinal area; in more mature specimens this plate grows forward and rises to level of cardinal area; in old gibbous specimens it forms convex plate which may almost cover delthyrium, rises higher than cardinal area and spreads to cover dental grooves bordering delthyrium. This flat transverse delthyrial plate or immature deltidium has no connection with grooves bordering delthyrium thought by some to indicate former presence of a deltidium.

Brachial valve strongly arched along midline over umbo but more gently beyond. Fold prominent, extending from beak to front, strongly elevated, summit rounded with sides curving strongly to borders of lateral slopes, truncated anteriorly by opposite sulcal extension. Umbo low, broadly convex; beak small, scarcely projecting. Cardinal area low, slightly inclined to plane of valve, making acute angle with area of opposite valve. Lateral slopes regularly arched from back to front, curving with moderate rapidity from fold to lateral margins, concave in front of cardinal angles. Cardinal process a concave radially and minutely grooved area; other internal structures unknown.

Entire surface of valves, excepting cardinal areas, marked by radiating plications, about twenty on fold and in sulcus, nearly forty on each slope. Plications of fold derived from two broad flat plications on beak which continue forward at borders of the fold, giving rise to those between by repeated division; those in sulcus formed by repeated division of the lateral-most plications. Plications low, broadly convex to nearly flat, especially near front margin, separated by narrow furrows. Growth lines fine, numerous near front and lateral margins of most specimens. Finer markings usually not apparent but radial striae may be faintly indicated. One specimen, in part unusually well preserved, possesses nearly round surface granules. Entire surface of smallest specimen collected, less than eight millimeters long, including outer regions of cardinal area of pedicle valve covered with finely nearly circular papillae.

This species has been generally identified as *Spirifer whitneyi* Hall, a form common in the Cerro Gordo member of the Lime Creek of Iowa. There are many differences, however, which not only indicate that these are separate species but may differ generically. *C. kindlei* is much larger, differently shaped, more strongly biconvex, with lateral margins more nearly straight, has a broader, deeper sulcus, rounded at bottom instead of subangular, and a proportionately higher fold. Its cardinal area is relatively lower, more curved, and its posterior borders instead of sloping from beak to cardinal angles, are nearly parallel to the hingeline so that the height is nearly the same to the extremities. Also in this species the transverse delthyrial plate is extended anteriorly into a convex deltidium which nearly or quite closes the delthyrium. The transverse plate of *C. whitneyi* is short, flat and simple. The plications are notably different in two species; those of *C. kindlei* are broad, very low, flat, especially near the front and

separated by shallow linear furrows; those of *C. whitneyi* are broadly convex along the summit and separated by wider deeper furrows. The dental plates of *C. kindlei* are higher and extended considerably farther forward. The fine surface papillae of *C. whitneyi* appear to be more elongate than those of *C. kindlei*.

This species is considerably larger than *C. gallatinensis* (Haynes), has much flatter and more numerous plications; lateral margins of shell are nearly straight instead of rounded and the delthyrium is nearly closed by a delthyrial plate in the form of a deltidium.

It is more similar to *C. monticola* (Haynes) but attains larger size, is generally broader proportionately, has broader, flatter and more numerous plications, longer hingeline, a more curved and lower cardinal area with less sloping posterior shoulders. Surface ornamentation may be different; none is described for *C. monticula* and none appears in the illustrations. That species apparently lacks the deltidium-like development of the transverse plate of *C. kindlei*.

Occurrence.—Percha formation, Bella member of Hillsboro, Kingston, and east end of Rhodes' Pass, San Andres Mts., New Mexico; Mt. Martin near Bisbee, Arizona.

Types.—Holotype M.A.S. 1591 A; paratypes M.A.S. 1591, 1624, 1633.

CYRTOSPIRIFER BREVIPOSTICUS
Stainbrook, n. sp.
Plate 44, figures 3–6

Shell small to medium in size, inequally biconvex, subquadrate in outline with hingeline shorter than greatest breadth, lateral margins broadly rounded toward front, cardinal angles not extended. Holotype, a small specimen, measures 9.1 mm. in length, 12.3 mm. in width and 7.8 mm. in thickness. Incomplete specimens indicate that considerably larger dimensions may be attained.

Pedicle valve gently arched from beak to front, strongly arched transversely in posterior portion, highest at beak, surface sloping strongly and nearly directly to lateral margins. Sulcus originating at beak, broad, shallow at front, gently concave at bottom, projecting a little as rounded lingual extension. Umbo elevated; beak pointed, a little twisted, slightly or not at all incurved. Cardinal area high, flat or very gently curved, divided by high narrow delthyrium. A flat transverse delthyrial plate extends forward filling one-third of opening and is sunken below edge of area.

EXPLANATION OF PLATE 46

FIGS. *1, 2—Buxtonia singularis* Stainbrook n. sp. Pedicle and brachial views of holotype, M.A.S. 1611, San Andres Mountains, near Rhodes' Pass, New Mexico. (p. 314)

3–5—Echinoconchus laminatus (Kindle). *3*, Pedicle view; *4–5*, pedicle views; the latter ×2, M.A.S. 1588, Hillsboro, New Mexico. (0. 314)

6–7—Avonia defessa Stainbrook, n. sp. Pedicle and anterior views of holotype, M.A.S. 1612, Hillsboro, New Mexico. (p. 309)

8–10—Krotovia spinigera (Kindle). *8–9*, Pedicle and brachial views. *10*, Pedicle view of another specimen. Both M.A.S. 1599, Hillsboro, New Mexico. (p. 313)

11–15—Krotovia praecursor Stainbrook, n. sp. *11*, Pedicle view; *12*, lateral view of another specimen; both M.A.S. 1609. *13–14*, Pedicle and brachial views of holotype. *15*, Pedicle view of same, ×2, M.A.S. 1609 A. All from Hillsboro, New Mexico. (p. 313)

16, 17—Heteralosia nupera Stainbrook, n. sp. *16*, Pedicle view of holotype, M.A.S. 1598 A. *17*, Brachial view of a paratype showing wide areas, M.A.S. 1598. Both from Hillsboro, New Mexico. (p. 309)

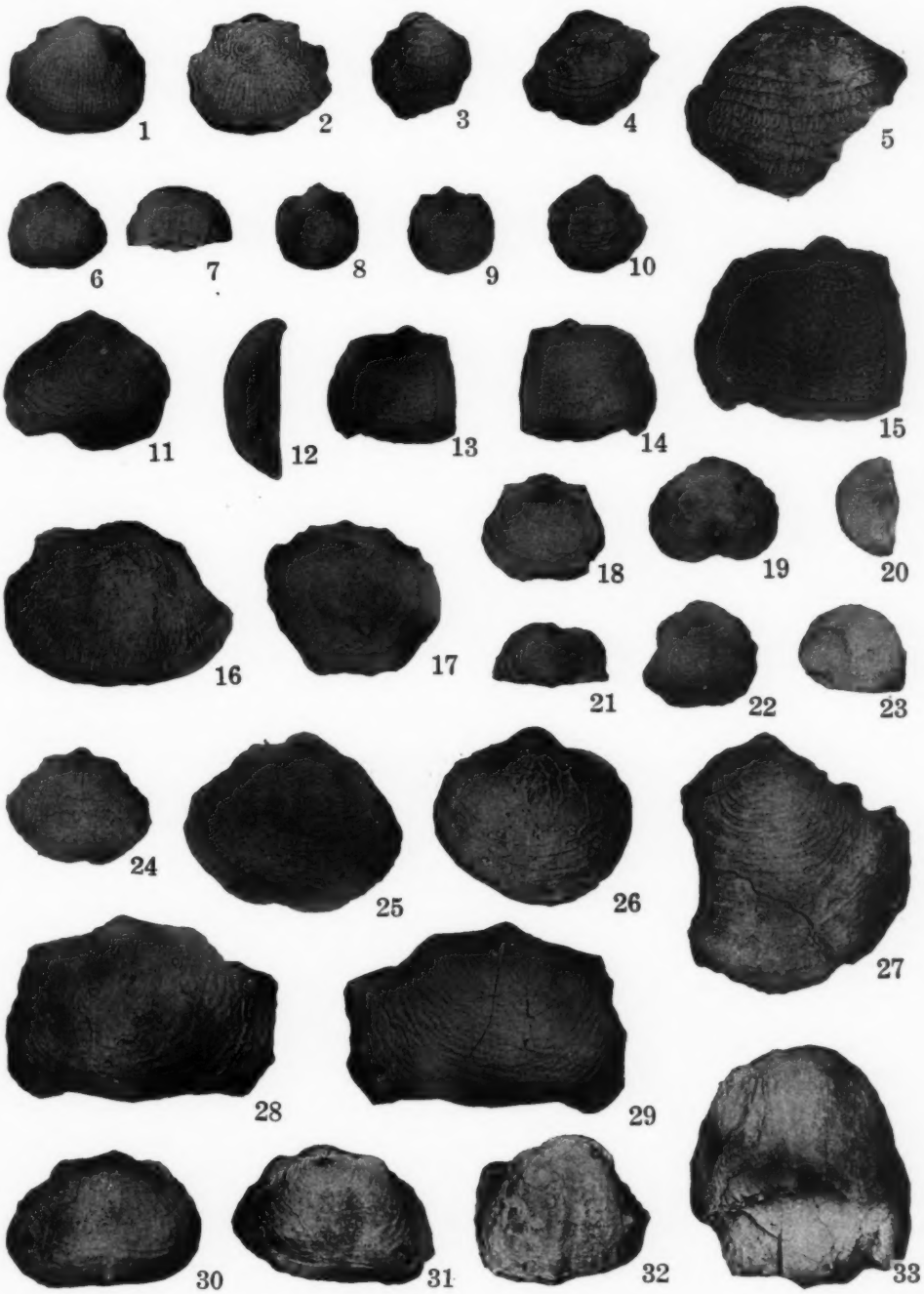
18–20—Leioproductus coloradensis (Kindle). Brachial, pedicle and lateral views of three specimens. M.A.S. 1606, Hillsboro, New Mexico. (p. 308)

21–23—Leioproductus plicatus (Kindle). Posterior, pedicle and anterior views of three specimens, M.A.S. 1607, Hillsboro, New Mexico. (p. 308)

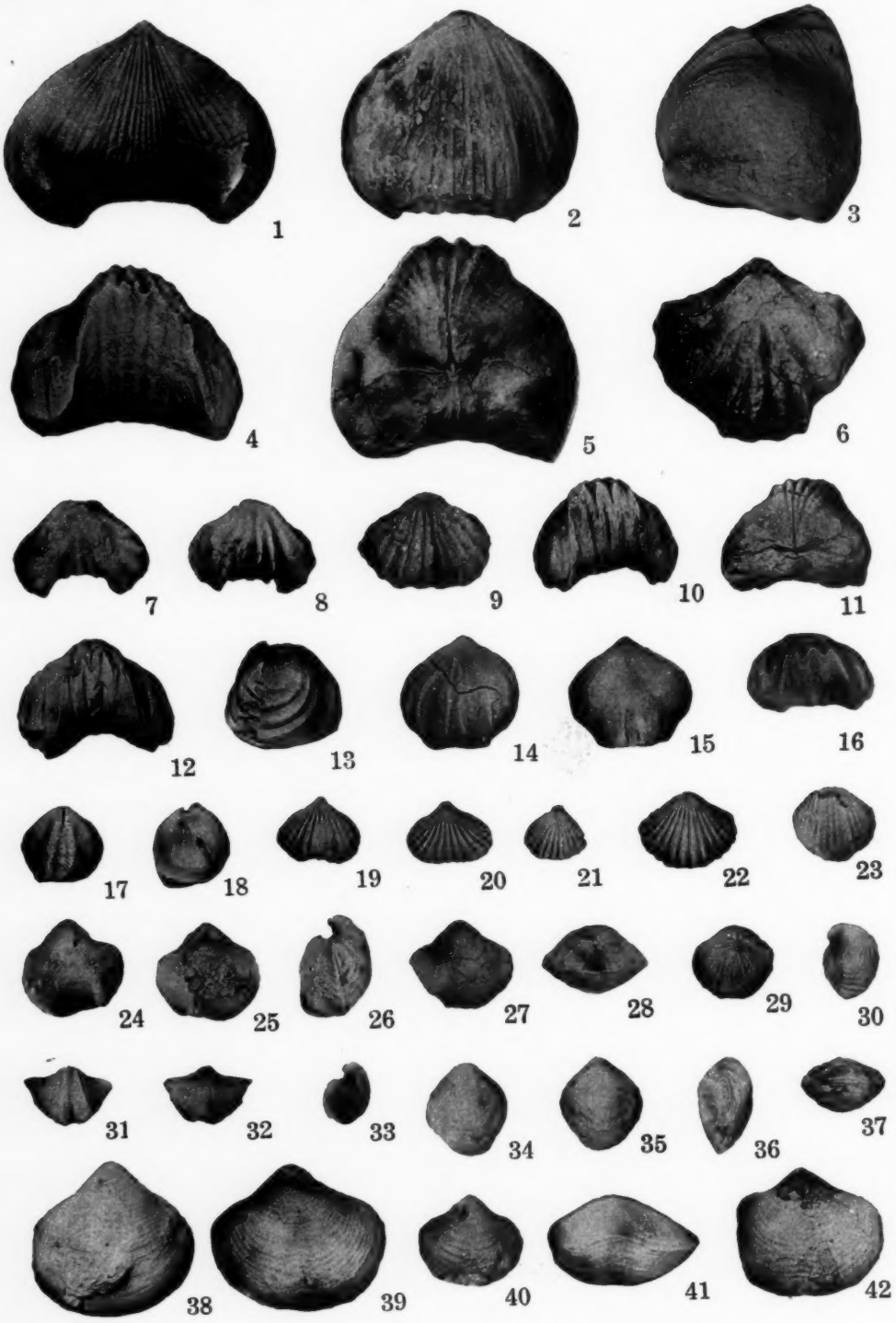
24–26—Pustula praecedens Stainbrook, n. sp. *24–25*, Brachial and pedicle views of holotype, the latter, ×2, M.A.S. 1610 A. *26*, Pedicle view of a paratype, M.A.S. 1610. Both from Hillsboro, New Mexico. (p. 312)

27–29—Planoproductus hillsboroensis (Kindle). *27*, Brachial view; *28–29*, pedicle and brachial views. Both M.A.S. 1590, Hillsboro, New Mexico. (p. 310)

30–33—Bispinoproductus varispinosus Stainbrook. *30–31*, Pedicle and brachial views of holotype, M.A.S. 1597 A. *32*, Pedicle view. *33*, Anterior view of another specimen, showing interior of brachial valve with bifid cardinal process. Both M.A.S. 1597. All from Hillsboro, New Mexico. (p. 311)



Stainbrook – Percha Brachiopods



Stainbrook – Percha Brachiopods

Brachial valve much less convex, gently arched from back to front and from side to side, highest in middle. Fold starting at beak, increasing slowly in width and height to front, broadly convex, bordered laterally by furrows larger than those on slopes.

Surface of both valves marked by fine narrow plications, simple on the slopes where they number about eighteen, seven in sulcus and on fold, increasing by division of the middle ones. Surfaces of most specimens considerably worn, plications apparently marked by fine radial ridgelets. Several specimens show surface to be finely papillose. Shell substance apparently impunctate.

This species differs from *C. kindlei* in size and shape, in the flatness and form of the pedicle area and in the lack of a deltidium-like delthyrial plate. It may be distinguished from *C. animasensis* (Girty) which also has a flat area, by its quadrate outline, non-extended cardinal angles and in having the greatest width in front of hingeline.

Occurrence.—Percha formation, Bella member at Hillsboro and at east end of Rhodes' Pass, San Andres Mts., New Mexico.

Types.—Holotype, M.A.S. 1631 A; paratypes 1631, 1619.

Genus BRACHYTHYRIS McCoy

BRACHYTHYRIS BISBEENSIS Stainbrook, n. sp.

Plate 47, figures 23, 29–30

Shell small, spiriferoid, subequally biconvex, subpentagonal in outline, a little wider than long, broadest at midlength or farther forward, cardinal angles not extended, hingeline slightly shorter than breadth. Dimensions of holotype are: length 10.4 mm., width 11.9 mm. and thickness 8.9 mm.

Pedicle valve strongly arched from beak to front, curvature greatest over umbo, highest posterior to midlength, strongly arched transversely. Sulcus beginning on umbo, broad, shallow anteriorly, bottom gently concave, bordered by plications slightly larger than those on slopes, continued at front into short rounded lingual extension. Umbo strong, broadly convex, greatly extended beyond hingeline. Beak short, blunt, incurved. Cardinal area strongly curved, sides sloping almost directly to cardinal angles. Interior unknown.

Brachial valve moderately arched over umbo, gently thence to front, more strongly arched transversely. Surface highest at midpoint or anteriorly. Fold originating at beak, broadly convex, flattened a little along summit, moderately elevated. Umbo low,

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EXPLANATION OF PLATE 47

FIGS. *1–5—Paurorhyncha cooperi* Stainbrook, n. sp. *1*, Pedicle view of holotype, M.A.S. 1603 A. *2–5*, Brachial, lateral, anterior and posterior views of four specimens; all M.A.S. 1603. All from Hillsboro, New Mexico. (p. 315)

6–13—Paraphorhynchus perchaensis Stainbrook, n. sp. *6*, Brachial view of holotype, ×2, showing radiating costae. *7–8*, Pedicle and brachial views of holotype, M.A.S. 1596 A. *9*, Brachial view; *10–11*, anterior and posterior views; *12–13*, anterior and lateral views of three specimens; all M.A.S. 1596. All from Hillsboro, New Mexico. (p. 316)

14–18—Shumardella glabraventra Stainbrook, n. sp. *14–16*, Pedicle, brachial and anterior views of holotype, M.A.S. 1587 A. *17–18*, Brachial and lateral views of small internal mold, M.A.S. 1587. Both from San Andres Mountains near Rhodes' Pass, New Mexico. (p. 317)

19–22—Camarotoechia sobrina Stainbrook, n. sp. *19–21*, Brachial, pedicle and brachial views of three paratypes, M.A.S. 1594. *22*, Brachial view of holotype, M.A.S. 1594 A. All from Hillsboro, New Mexico. (p. 314)

23, 29, 30—Brachythyris bisbeensis Stainbrook, n. sp. Pedicle, brachial and lateral views of holotype, M.A.S. 1623; Mt. Martin, Bisbee, Arizona. (p. 321)

24–28—Brachythyris putilla Stainbrook, n. sp. *24–26*, Pedicle, brachial and lateral views of holotype, M.A.S. 1585 A. *27–28*, Pedicle and posterior views of a paratype, M.A.S. 1585. Both from Hillsboro, New Mexico. (p. 322)

31–33—Tylothyris novamexicana Stainbrook, n. sp. Pedicle, brachial and lateral views of holotype, M.A.S. 1620, San Andres Mountains near Rhodes' Pass, New Mexico. (p. 323)

34–37—Dielasma coriforme Stainbrook, n. sp. Pedicle, brachial, lateral and anterior views of holotype, M.A.S. 1618, Hillsboro, New Mexico. (p. 318)

38–42—Torynifer spinosus (Kindle). *38–39*, Pedicle and brachial views of a large specimen. *40*, Pedicle view; *41–42*, anterior and brachial views of two specimens. All M.A.S. 1589, Hillsboro, New Mexico. (p. 325)

broadly convex; beak short. Lateral slopes gently curved from fold to sides, strongly curved from hingeline forward. Interior unknown.

Surface of both valves marked by plications of moderate strength, low, broadly convex, separated by narrow furrows, about seven to eight on each slope, two plications in posterior part of fold divide on umbo making four of which the middle two are larger, two large medial plications in sulcus with a short one on each side diverging from the border plications. Growth lines few, occasionally strong.

This species differs from *B. putilla* in its smaller size, different shape, stronger plications and in having fold and sulcus plicate.

Occurrence.—Percha formation, on Mt. Martin, near Bisbee, Ariz.

Type.—Holotype, M.A.S. 1623.

BRACHYTHYRIS PUTILLA Stainbrook, n. sp.
Plate 47, figures 24–28

Shell small, inequally biconvex, subovate in outline with rounded cardinal angles, short hingeline, broadly rounded anterolateral margins, anterior margin short and straight, greatest width near middle. Dimensions of holotype and a paratype are: length 14.6 mm. and 13.1 mm.; width 15.5 mm. and 15.6 mm.; thickness 10.1 mm. and 9.8 mm.

Pedicle valve strongly arched over umbonal region, less so to front, highest near midpoint, strongly arched transversely. Sulcus originating on umbo, sides merging with lateral slopes posteriorly, widening and deepening toward front, rounded at bottom, continued anteriorly as broad rounded lingual extension at right angles to plane of valve; lateral slopes curved strongly from sides of sulcus to lateral margins, gently curved from umbo to front, concave toward cardinal angles. Umbo strongly convex, protuberant, strongly extended beyond the hingeline. Beak small, pointed, projecting, incurved. Cardinal area small, narrow, flat in lower portion, curved beneath beak, vertically and horizontally striated, margins inconspicuous and merging with slopes. Delthyrium open to apex, broad. Two thin dental lamellae extend forward about one-fourth the length of valve.

Brachial valve less convex than pedicle, strongly arched along midline on beak and umbo, gently curved toward front, broadly and regularly arched transversely, highest near middle. Fold originating on umbo, rapidly increasing in width and height toward front, strongly elevated, broadly rounded on summit, truncated anteriorly by opposite sulcus. Lateral slopes curving moderately from fold to lateral margins, regularly and gently curved from front toward back. Umbo broad, low, slightly projecting. Beak small; area low, in plane of valve, divided by low notothyrium.

Lateral slopes marked by about eight low, simple broadly convex plications which are obsolete on umbones. Fold and sulcus smooth.

This species is smaller than *B. burlingtonensis* Weller, more transverse, and proportionately shorter. It is similar to *B. fernglenensis* Weller in size, but has less prominent plications on the slopes, a broader sulcus which does not extend to beak, more rounded cardinal angles and a proportionately shorter and less thick shell.

Occurrence.—Percha formation, Bella member, at Hillsboro, New Mexico.

Types.—Holotype M.A.S. 1585 A; paratypes M.A.S. 1585.

Genus SYRINGOSPIRA Kindle

Syringospira, Kindle 1909, U.S.G.S. Bull. 391, pp. 28–29; Cooper 1944, Index Fos. of N.A., p. 327.

From Kindle's description a deltidium and a flat transverse plate appear to be present in the pedicle valve of this genus. My study suggests that there is only one structure which towards the front, may rise, become convex and assume the appearance of a deltidium. The grooves beside the lateral borders of the delthyrium have sometimes been thought to indicate the former existence of a deltidium, the edges of which are supposed to have fitted into these grooves. However, the grooves pass beneath the edge of the brachial valve onto the surface of the hingeteeth. Apparently they cannot have been produced by a deltidium if it existed and they may be related to the development of the teeth.

The surface of the shell, as shown by my specimens is marked by numerous papillae which give it a twilled appearance similar

to that of *Syringothyris*. The shell substance, however, appears to be impunctate.

Cooper has assigned *Spirifer altus* Hall to *Syringospira* which it resembles because of a large cardinal area in the pedicle valve and a large transverse delthyrial plate. It appears to differ, however, in not having the fold and sulcus as strongly plicate and in lacking the pear-shaped delthyrial tube, no indication of which is shown in Hall's illustrations. *Syringospira prima* appears to be more specialized and, therefore, of younger age than *Spirifer altus* Hall.

SYRINGOSPIRA PRIMA Kindle
Plate 44, figures 13–16

Syringospira prima, Kindle 1909, U.S.G.S. Bull. 391, pp. 29–30, pl. 7, figs. 1–1a; Cooper 1944, Index Fos. N.A., p. 327, pl. 125, figs. 12–14.

Seven specimens of this species show a few details not noted in the original description. The most complete measures 27.2 mm. from beak of pedicle valve to anterior commissure, 18.7 mm. in length of brachial valve, 45.5 mm. in width (slightly incomplete). Cardinal area 37.1 mm. high, thus exceeding the length of either valve; so greatly retrorse that it slopes posteriorly at an angle of 45° to the plane of the brachial valve. An incomplete specimen indicates that somewhat larger dimensions may be attained.

The transverse delthyrial plate is flat and sunken below the level of the cardinal area for half the distance to the brachial valve where it rises and becomes more convex. Its wider end is concave and a triangular opening is provided for either the pedicle or the diductor muscles. Thus it may appear to be a deltidium about halfway forward, but my specimen suggests that a deltidium and a delthyrial plate were not both present. It is unclear what function a deltidium if present would have and how it would be formed with an extensive delthryial plate immediately beneath. The pearshaped delthyrial tube has been partially exposed in two specimens and is strongly marked by transverse wrinkles. The structure of this tube is not clear. Kindle suggested that it is formed by the delthyrial supporting plates which curve inward and meet to produce the base and sides of the tube. No evidence of this union is apparent, however. Possibly the lower portion of the tube is a structure separate, except at the sides, from the dental lamellae, secreted by the pedicle as it moved forward in response to the increasing height of the cardinal area.

Cardinal area on each side of the delthyrium divided into regions as in *Syringothyris;* the inner regions are horizontally and vertically marked, the outer ones granulose and horizontally striate. Cardinal area of brachial valve very low, of nearly uniform height throughout, also divided into regions, forming a right angle with that of other valve. Notothyrium broad, low, bordered laterally by chilidial ridges. Cardinal process convex, vertically ridged.

Surface of best preserved specimens covered by abundant slightly elongated papillose projections, ending abruptly anteriorly, giving appearance similar to surface of *Eosyringothyris* and *Syringothyris*. Shell substance where broken or worn does not appear, under magnification, to be punctate.

Occurrence.—Percha formation, Bella member at Hillsboro, New Mexico; Mt. Martin, near Bisbee, Arizona.

Types.—Hypotypes M.A.S. 1582; 1622.

Genus TYLOTHYRIS North
TYLOTHYRIS NOVAMEXICANA
Stainbrook, n. sp.
Plate 47, figures 31–33

Shell small, spiriferoid, subequally biconvex, subelliptical in outline, broadest along hingeline, cardinal angles extended. Holotype measures 9.1 mm. in length, 13.2 mm. in width and 7.8 mm. in thickness.

Pedicle valve strongly arched from beak to front, curvature greatest posteriorly, moderately arched transversely in middle, slightly concave toward angles. Sulcus strong, deep, originating at beak, sharply angular at bottom, sides flat, front portion projecting as V-shaped lingual extension, bordered laterally by plications a little more pronounced than those on slopes. Umbo strong, narrow, projecting posteriorly. Beak short, strongly incurved. Cardinal area nearly flat, curved beneath beak, nearly uniform in height throughout, horizontally striated, divided by an open delthyrium which is higher than wide and has small apical callus. Interior unknown.

Brachial valve moderately arched along midline from beak to front, more strongly arched transversely in anterior portion, highest in front of midpoint. Fold beginning at beak, broadly convex, incised at front by lingual extension of opposite valve, elevated, bounded at sides by narrow furrows. Umbo broad, low, beak short; cardinal area very low.

Lateral slopes of both valves marked by ten simple radial plications, broad, low, rounded on summits, separated by narrower furrows, decreasing in size toward cardinal angles. Fold, sulcus, and slopes marked by numerous growth laminae, regularly spaced. Finer ornamentation doubtful, edges of laminae probably not spiniferous. Shell impunctate.

Reference of this species to *Tylothyris* is provisional as internal features are unknown. The external form, absence of punctae and spines on growth laminae favor this assignment.

Occurrence.—Percha formation, at east end of Rhodes' Pass, San Andres mountains, New Mexico.

Type.—Holotype M.A.S. 1620.

Genus STROPHOPLEURA Stainbrook, n. gen.

Shells of medium size, spiriferoid, short, broad, transversely semi-elliptical with extended cardinal angles, concave anterolateral margins and short front margin.

Pedicle valve more convex than brachial, strongly and regularly arched along midline, highly convex and elevated in median portion, concave toward cardinal angles. Sulcus originating on beak, deep, narrow, flat bottomed, bordered by large plications giving appearance of deeply sulcate median fold. Umbo high, narrowly convex, projecting posteriorly beyond hingeline. Beak small, short, incurved. Cardinal area highest and curved beneath beak only, low, flat or very gently curved laterally, of uniform height to extremities, marked by faint vertical ridges. Delthyrium higher than wide, covered by very convex deltidium which almost closes opening in old individuals.

Brachial valve moderately convex from beak to front, more strongly curved posteriorly, broadly and gently convex transversely nearly to cardinal angles, or slightly concave near extremities. Fold extending from beak to front, narrow, strongly convex, but little elevated above slopes, bordered laterally by furrows broader and deeper than those on slopes, summit flattened near front or with slight suggestion of a sulcus. Umbo broad, low, scarcely elevated; beak slightly projecting. Cardinal area low, in plane of valve, nearly at right angles to other area, divided by a broad low notothyrium.

Plications of lateral slopes of both valves 10 to 15, strong but low, convex, of moderate width, separated by much narrower furrows; only one or two nearest fold and sulcus reach beak, others originate at border of cardinal area where they are broader and often turn slightly toward cardinal angles; most numerous at cardinal margins, several disappearing a short distance anteriorly. Plications of nearly uniform size except those bordering fold or sulcus; those bounding sulcus two to three times as large as others, strongly elevated, nearly as large as fold. Fold and sulcus crossed by abundant regularly spaced growth laminae. No spines apparent but they may have occurred. Shell substance impunctate. No internal septa noted in either valve.

The genotype is *Spirifer notabilis* Kindle. This genus differs from *Reticulariina* in having a non-septate pedicle valve and an impunctate shell, and from *Tylothyris* in lacking a median septum in the pedicle valve and in the different form of the plications. It is similar to *Mucrospirifer* but the shell is generally smaller and shorter, the plications less numerous and differently arranged along the cardinal margin, the plications bordering the sulcus conspicuously enlarged and delthyrium nearly closed by a strongly convex deltidium. It may have evolved from that genus.

STROPHOPLEURA NOTABILIS (Kindle) Plate 44, figures 17–20

Spirifer bimesialis, Girty 1900, 20th Ann. Rept. U.S.G.S. pt. 2, p. 55.
Spirifer notabilis, Kindle 1909, U.S.G.S. Bull. 391, p. 26, pl. 7, figs 3–6c.

This species has been adequately described by Kindle and in foregoing generic diagnosis. All specimens seen are incomplete as each has lost some portion of an extremity. Measurements of several hypo-

types are: length 11.8 mm., 11.8 mm. and 12.5 mm.; width 28.6 mm. (restored), 28.8 mm. and 25.8 mm.; thickness 10 mm., 8.9 mm. (incomplete) and 11.8 mm.

Judging from Weller's illustration, this species is similar to *Delthyris novamexicana* (Miller) from the Lake Valley of New Mexico and Fern Glen of Missouri with which it appears to be congeneric. Although no specimen of *D. novamexicana* has been available for comparison, *S. notabilis* apparently differs by being somewhat larger and thicker and having nearly twice as many plications on each lateral slope.

Occurrence.—Percha formation, Bella member, at Hillsboro, New Mexico.

Types.—Hypotypes M.A.S. 1586.

Genus TORYNIFER Hall and Clarke
TORYNIFER SPINOSUS (Kindle)
Plate 47, figures 38–42

Reticularia spinosa, Kindle 1909, U.S.G.S. Bull. 391, pp. 27–28, pl. 9, figs. 4–5.

Shell small to medium in size, unequally biconvex, subovate in outline with rounded antero- and postero-lateral margins, wider than long, broadest at midlength, hingeline about half maximum width of shell, anterior commissure gently sinuate. As shown by my specimens, Kindle's type is a small immature example. Measurements of three hypotypes are: length 13.3 mm., 22.1 mm. and 22.4 mm.; width 15.3 mm., 24.3 mm. and 25.6 mm.; thickness 9.1 mm., 15.9 mm. and 15.8 mm.

Pedicle valve strongly arched over beak and umbo, less strongly toward front, highest on umbo; surface sloping with moderate rapidity to lateral margins, concave on each side of umbo, incurved beneath beak. Central portion depressed by shallow median sulcus which begins on umbo, widens and deepens toward front, with rounded bottom and borders merging gradually with lateral slopes. Umbo strong, narrow, projecting, curved. Beak small, pointed, incurved beyond and over hingeline. Cardinal area indistinctly bounded at sides, small, nearly flat, curved toward beak, vertically striated. Delthyrium broad, low, open; thin lamellae rising from borders, possibly remnants of a convex deltidium, are deflected toward midline. Two lateral septa extend forward along floor of valve for about one-third length of shell; a median septum extends still further forward between them.

Brachial valve less convex than pedicle, highest near umbo, surface sloping gently to front and lateral margins, slightly concave on each side of beak. Cardinal area elevated along midline into fold extending from umbo to front, widening but little, scarcely defined at sides. Umbo broadly convex; beak small, but little projecting. Cardinal area low, vertically striated, in plane of valve, at right angles to plane of opposite valve, divided by notothyrium covered with low broad chilidium. A median septum supports a concave hingeplate internally.

Exterior of both valves marked by numerous concentric, more or less regularly spaced bandlike growth lamellae, becoming more crowded anteriorly; front edge of each bears single series of longitudinally elongated spine bases. Spines small, double, about one millimeter long, occurring at regular intervals; these spines themselves bear lateral generally paired minute spinules.

This species is quite unlike others in the Mississippian. It is smaller than *T. pseudolineata* (Hall) and *T. setigera* (Hall) and larger than *T. cooperensis* (Swallow).

Occurrence.—Percha formation, Bella member, at Hillsboro, New Mexico.

Types.—Hypotypes M.A.S. 1509.

Superfamily ROSTROSPIRACEA
Family ATHYRIDAE
Genus COMPOSITA Brown

COMPOSITA BELLULA Stainbrook, n. sp.
Plate 45, figures 15–18, 23–24

Meristella barrisi Hall?, Kindle 1909, U.S.G.S. Bull. 391, p. 30, pl. 9, figs. 7–9a.

Shell below medium size, subequally biconvex, subpentagonal to subovate in outline with postero-lateral sides longest, a little wider than long with greatest width anterior to midlength; anterior commissure slightly sulcate. Holotype and a paratype measure 16.5 mm. and 16.7 mm. in length, 17.2 mm. and 17.5 mm. in width and 9.2 mm. and 10 mm. in thickness.

Pedicle valve more convex than brachial, strongly arched posteriorly, gently arched anteriorly, regularly and moderately arched transversely, highest on umbo. Lateral surfaces sloping with even gentle curvature

from umbo to antero-lateral margins, more abruptly to postero-lateral borders, concave on each side of beak; central part depressed in anterior half by broad shallow sulcus whose borders gradually merge with lateral slopes. Umbo prominent, elevated, projecting posteriorly. Beak short, blunt, abruptly incurved, pierced by large subcircular foramen. Interior unknown.

Brachial valve gently convex, highest in umbonal region, surface sloping evenly and gently to antero-lateral margins, more rapidly posteriorly; mesial portion elevated anteriorly to form broad low fold, most prominent at front, little elevated above remainder of valve, faintly delimited except by gentle depressions at front. Umbo broad, low; beak small, projecting very slightly.

Surfaces of both valves nearly smooth, concentric growth striae fine, at irregular intervals some may be more prominent but never produce laminae or bear spinules.

This species appears to be unlike any described from formations of the Mississippi Valley.

Occurrence.—Percha formation, Bella member, at Hillsboro, New Mexico.

Types.—Holotype M.A.S. 1583; paratypes 1583.

Genus CLEIOTHYRIDINA Buckman

CLEIOTHYRIDINA RETICULATA
Stainbrook, n. sp.
Plate 45, figures 31–35

Shell below medium size, subpentagonal to subovate in outline, generally slightly longer than wide but some are slightly wider than long. In elongate specimens postero-lateral margins long, only slightly curved, meeting at beak in acute angle; in the broader forms cardinal angle obtuse. Lateral margins broadly curved, front margin straight, extended a little farther than main part of shell; hingeline short, considerably less than greatest width which is anterior to midlength. Anterior commissure strongly sinuate. Two variations in form, broad and elongate, are indicated by measurements. Holotype and two paratypes measure: length 18.2 mm., 17.5 mm., and 17.8 mm.; width 17.8 mm., 17.2 mm., and 17.7 mm.; thickness 13.3 mm., 12.8 mm., and 11.1 mm. Three broad forms measure: 16.4 mm., 18.1 mm. and 18.8 mm. in length; 16.8 mm., 18.6 mm. and 20.1 mm. in width; 11.5 mm., 12.9 mm. and 16.7 mm. in thickness. The same variation is apparent in four immature specimens: length 11.6 mm. and 11.2 mm.; width 11.1 mm.; and 9.7 mm.; thickness 8.6 mm. and 7.4 mm.; the broader variety is 11.6 mm. and 9.8 mm. long, 12.8 mm. and 10.4 mm. wide, and 7.5 mm. and 6.2 mm. thick.

Pedicle valve about as convex as brachial, strongly arched along midline from beak to front, more strongly over umbo, more sharply arched transversely with median portion flattened, highest on umbo. Surface curving gently from umbo to antero-lateral margins along ridges bordering the sulcus, strongly deflected from ridges to cardinal angles, incurved beneath umbo to hingeline. Sulcus initiated on umbo, widening and deepening gradually, gently rounded at bottom, sides merging with lateral slope ridges, anterior greatly extended into lingual extension, acutely rounded at front and at right angles to plane of valve. Umbo high, narrow, projecting beyond hingeline. Beak short, blunt, sharply incurved, bearing large oblong apical foramen. Interior unknown.

Brachial valve most convex anteriorly, moderately arched from umbo to front, a little more curved posteriorly, strongly arched transversely. Surface highest at midpoint or anteriorly where broad convexity continues forward uniformly into fold which is narrow, convex at summit, most elevated and truncated at front, bordered at sides by short sulci gradually merging with short lateral slope ridges. Umbo broad, low; beak small, scarcely projecting. Interior unknown.

Surfaces of both valves marked by numerous slightly laminose growth lines, regularly spaced at intervals of one-half millimeter or less. Short flat spines about one-half millimeter long project forward from laminae at regular intervals, arranged in lines radiating forward from beaks, usually preserved only in patches on well preserved specimens. In absence of spines surface appears reticulate.

Greater thickness, different shape, well developed fold and sulcus distinguish this species from *C. coloradensis* Girty or *C. transversa*, n. sp. Of the Mississippian forms from the Mississippi valley it most resem-

bles *C. prouti* (Swallow) in size and shape but is more elongate. Smaller but otherwise similar specimens occur in the Lake Valley beds near Hillsboro, New Mexico.

Occurrence.—Percha shale, south of east entrance of Rhodes' Pass, San Andres Mts., New Mexico.

Types.—Holotype M.A.S. 1588 A; paratypes M.A.S. 1588.

CLEIOTHYRIDINA? COLORADENSIS (Girty)
Plate 45, figures 25–30

Athyris coloradensis (part), Girty 1900, U.S.G.S. 20th Ann. Rpt. p. 46, pl. 5, figs. 5–11; Kindle 1909, U.S.G.S. Bull. 391, p. 24, pl. 6, fig. 9.

Two different forms may be distinguished among those described by Girty as *Athyris coloradensis*. One which is more oblong, thicker and less laminate externally, is chosen to represent this species. The holotype if not previously selected, is here designated as that illustrated by figure 5 on plate 5. The other form is described as *C.? transversa* n. sp.

Three hypotypes which appear to be representative, measure length 17 mm., 15.5 mm. and 16.9 mm.; width 18.2 mm., 15.1 mm. and 16.8 mm.; thickness 10.8 mm., 8.8 mm. and 9.2 mm.

Shell small, subequally biconvex, subquadrate in outline with width and length nearly equal, generally widest at the middle or anteriorly, hingeline straight, cardinal angles abruptly rounded, lateral margins long, broadly rounded toward front, front margin gently rounded, anterior commissure straight or slightly sinuous.

Pedicle valve more strongly convex than brachial, highest at midpoint, surface curving strongly to front and sides, concave toward cardinal angles. Umbo broadly convex, low, projecting but little posteriorly. Beak small, curved, bearing small apical foramen. A sulcus is faintly developed in some specimens. Interior unknown.

Brachial valve broadly arched from beak to front, more strongly curved over umbo, uniformly arched from side to side. Surface highest in umbonal region, curving equally to front and lateral margins, concave on each side of umbo; faint fold may be present. Beak small, concealed.

Exteriors of both valves commonly smooth because of wear or weathering, marked by concentric regularly spaced growth lines except toward front where they may be crowded. Best preserved specimens with laminae one millimeter or more wide which appear to have born spines.

Occurrence.—Percha formation, Bella member at Hillsboro, New Mexico: Ouray limestone of Colorado.

Types.—Hypotypes M.A.S. 1592.

CLEIOTHYRIDINA? TRANSVERSA
Stainbrook, n. sp.
Plate 45, figures 14, 19–22

Athyris coloradoensis (part) Girty 1900, U.S.G.S. 20th, Ann. Rpt. p. 46: Kindle 1909, U.S.G.S. Bull. 391, p. 24.

Shell below medium size, somewhat inequally biconvex, transversely subelliptical, wider than long; hingeline straight, slightly shorter than greatest width which is posterior to midlength; cardinal angles abruptly rounded; lateral margins long and broadly curving into short front margin; anterior commissure straight or gently sinuous. Measurements of holotype and two paratypes are: length 16.7 mm., 17.9 mm. and 16.8 mm.; width 22.3 mm., 24.8 mm. (one side restored) and 21.8 mm.; thickness 9.5 mm., 9.8 mm. and 9.4 mm.

Pedicle valve the more convex, highest at midpoint, moderately strongly arched from beak to front, curvature slightly greater posteriorly, broadly arched transversely. Surface broadly elevated medially, slightly flattened on lateral slopes, concave between beak and cardinal angles; faint sulcus may be present anteriorly. Umbo narrowly convex, not projecting posteriorly beyond hingeline. Beak small, short, broad, projecting slightly, pierced by small foramen. Interior unknown.

Brachial valve highest near midpoint. strongly arched over umbo, gently curved to front. Surface elevated broadly forward from umbo, concave or flattened toward cardinal angles. Umbo broad, low; beak short, but little projecting.

Surfaces of both valves marked by numerous growth lines, regularly spaced or crowded. Unworn specimens with strong laminae two or three millimeters wide which may be crowded to form shelflike border around front and lateral margins. Outer edges of laminae appear to have borne sel-

dom preserved fine spines.

This species is broader and generally thinner than *C.? coloradensis* with which it occurs, has a longer hingeline, and more posterior greatest width. It is also more strongly laminose, with broader laminae which are more commonly preserved. The size, transversity and laminose exterior distinguish it readily from other members of the genus from the Mississippian of the Mississippi Valley.

Occurrence.—Percha shale, Bella member, at Hillsboro, New Mexico. Apparently not as numerous as *Cleiothyridina coloradensis* (Girty)

Types.—Holotype M.A.S. 1595 A; paratypes 1595.

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CRETACEOUS MICROFOSSILS OF THE VERMILION AREA, ALBERTA[1]

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ABSTRACT—Sixteen new species and one new variety of Foraminifera and one new ostracode are described. Four previously named foraminifers and one previously named radiolarian are also described because of their importance as index fossils. A range chart shows the vertical distribution of the more useful index species in the Vermilion area.

INTRODUCTION

THIS article describes some of the more useful Cretaceous index microfossils of the Vermilion area in east-central Alberta, Canada.

The study was conducted under the direction of Dr. H. G. Schenck of Stanford University, and the writer takes this opportunity to express his deep appreciation. Dr. T. A. Link, Imperial Oil Company, Limited, supervised the field work. J. C. Sproule, Imperial Oil Company, Limited, imparted many helpful suggestions. Dr. R. T. D. Wickenden reported on several slides submitted to him for examination. Dr. A. Myra Keen and Lois T. Martin gave considerable assistance and advice. The description and figure of the ostracode *Cytheridea canadensis* was furnished by Dr. H. W. Scott for inclusion in this report. The Foraminifera were drawn by Mrs. D. D. Hughes of Stanford University.

The Cretaceous stratigraphy of the Vermilion area has been described in a recent article (Nauss, 1945). The sequence consists entirely of sands and shales with a minor amount of coal. Various combinations of these three materials together with their various characteristics have provided a basis for classifying them into six major units as follows:

	Thickness	*Environment*
Edmonton formation	1200′ ±	nonmarine
Bearpaw shale	200–300′	marine
Belly River group	900–1000′	nonmarine and near shore
Lea Park shale	700–800′	marine
Lloydminster shale	690–800′	marine
Mannville formation	250–550′	nonmarine and marine

All of these units are of late Cretaceous age except the Mannville formation, which is mainly of early Cretaceous age.

The Foraminifera described in this article are mostly from the Lea Park and Lloydminster shales but some are from the Cummings shale member of the Mannville formation (Nauss 1945, fig. 3).

VERTICAL DISTRIBUTION OF MICROFOSSILS

Nineteen species of Foraminifera have been reported previously from the Vermilion area in formal publications. Table 1 shows their stratigraphic occurrence and gives reference to the articles in which they were reported.

The microfossils are excellent guides in the Vermilion area. They are useful not only in identifying separate shale bodies but also in correlating zones within the thicker shale units, namely the Lea Park and Alberta shales. Figure 1 shows the vertical distribution of the microfaunas.

MICROFOSSIL ZONES

The Cummings member of the Mannville formation is characterized by arenaceous Foraminifera of which the most useful are: *Miliammina sproulei*, n. sp., *"Verneuilina" cummingensis*, n. sp., and *Haplophragmoides*

[1] This paper is part of a thesis presented to the Department of Geology, Stanford University, California, in partial fulfillment of the requirements for the degree of Doctor of Philosophy. It is published with the permission of The Imperial Oil Company, Limited. The first part, dealing with the stratigraphy, has already been published.

gigas minor, n. var. Four species continue up into the lower part of the Lloydminster shale: *Ammobaculites fragmentaria* Cushman, *Ammobaculites humei*, n. sp., *A. tyrelli*, n. sp., and "*Bigenerina*" *angulata* Cushman but they are not abundant in the Cummings member.

The lower part of the Lloydminster shale also contains abundant arenaceous Foraminifera. The most prominent species of this is almost barren of Foraminifera, but abundant small white collophane spheres serve to identify this part of the section.

The basal 20 to 40 feet of the Lea Park shale can be identified by the abundance of a small foraminifer, *Trochammina ribstonensis* Wickenden. Because of its restricted range and widespread occurrence this species is an excellent guide fossil.

The 240 feet of Lea Park shale above the

TABLE 1. CHECKLIST OF FORAMINIFERA IDENTIFIED FROM THE VERMILION AREA TO AND INCLUDING THE YEAR 1942

	Upper Cretaceous				
	Lloydminster shale		Lea Park shale		
	(1)	(4)	(2)	(3)	(4)
Ammobaculites coprolithiformis (Schwager)	x				
Ammobaculites fragmentaria Cushman	x				
Bigenerina angulata Cushman	x				
Epistomina caracolla Roemer					x
Gaudryina rugosa d'Orbigny		x			
Globigerina cretacea d'Orbigny		x			
Gümbelina globifera Reuss		x			
Haplophragmoides gigas Cushman	x				
Haplophragmoides glabra Cushman & Waters	x				
Haplophragmoides rugosa Cushman & Waters	x				x
Loxostomum tegulata Reuss		x			
Miliammina manitobensis Wickenden		x			
Neobulimina canadensis Cushman & Wickenden			x		
Planulina kansasi Morrow		x			
Planulina taylorensis Carsey					x
Tritaxia manitobensis Wickenden		x			
Trochammina ribstonensis Wickenden				x	
Verneuilina bearpawensis Wickenden					x
Verneuilina canadensis Cushman	x				

(1) Identified from British Petroleums well no. 3 near Wainwright by Cushman (1927b).
(2) Identified from the Lea Park by Cushman and Wickenden (1928).
(3) Identified from Imperial Ribstone well no. 1, Wickenden (1932a).
(4) Identified by Wickenden (1941) from wells at Lloydminster.

assemblage is *Haplophragmoides gigas* Cushman, which is restricted to this zone.

The central part of the Lloydminster shale is characterized by the four species: *Globigerina loetterli*, n. sp., *G. cretacea* d'Orbigny, *Haplophragmoides collyra*, n. sp., and *Gümbelina globulosa* (Ehrenberg). *Haplophragmoides* occurs immediately below the zone of *Globigerina*. The specimens are usually crushed and are undeformed only when the interiors are filled with pyrite.

The upper part of the Lloydminster shale *Trochammina ribstonensis* zone contains an abundant calcareous fauna. The species of this assemblage most useful for correlation are: *Epistomina fax*, n. sp. and *Anomalina solis* n. sp. This may be termed the *Epistomina fax* zone. These species also are widespread in distribution and restricted in range.

Above the *Epistomina fax* zone the uppermost occurrences of *Bathysiphon vitta* Nauss, n. sp., *Bolivina elkensis* Nauss, n. sp., and *Neobulimina canadensis* Cushman and

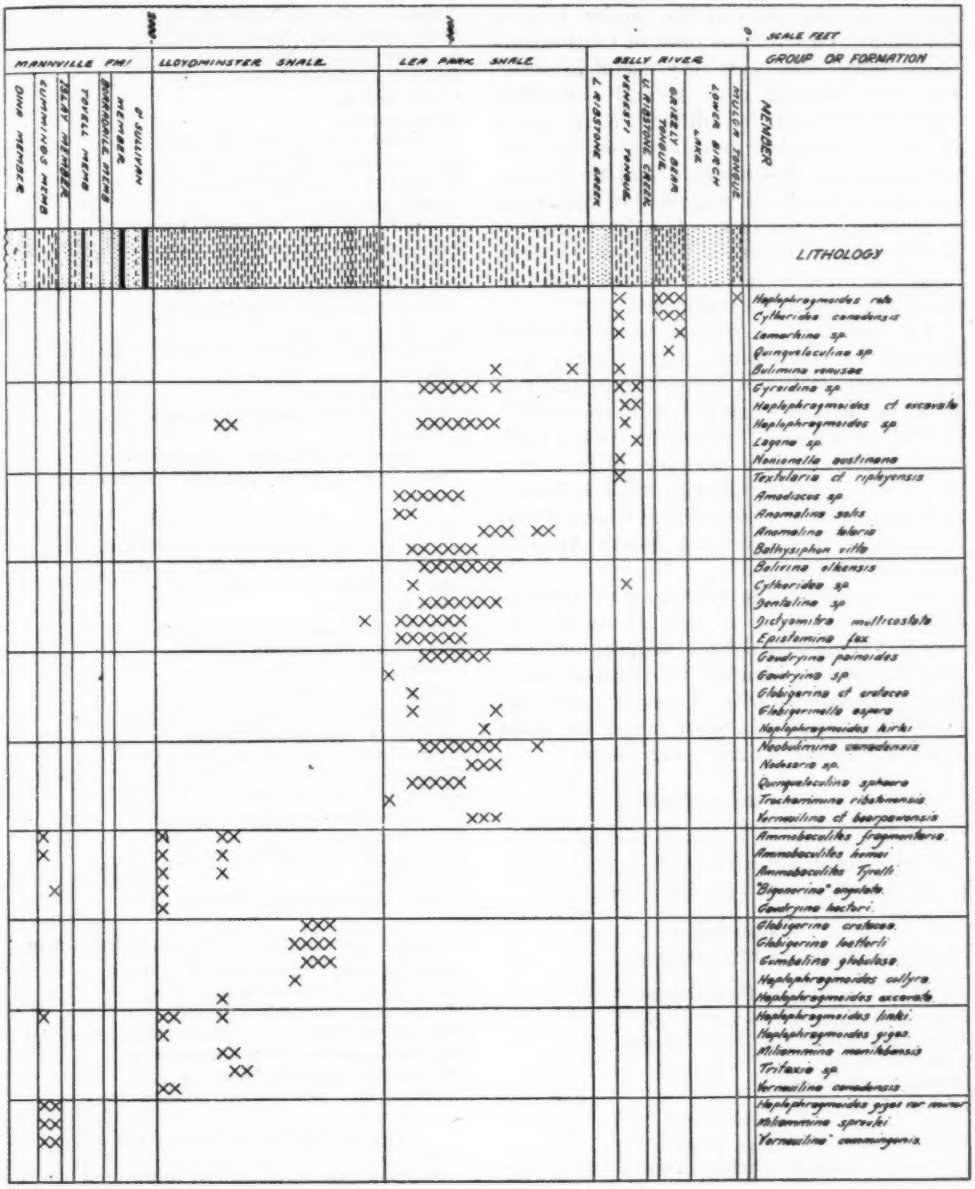


FIG. 1—Range chart showing the vertical distribution of the more useful index species of the Vermilion area, Alberta.

Wickenden are useful marker horizons in the Lea Park shale.

South of the small town of Derwent *Anomalina talaria* Nauss, n. sp., occurs in abundance in a zone 30 feet thick 170–200 feet below the top of the Lea Park. Microoolitic pyrite (Nauss 1945, p. 1619) is abundant in this zone, and a few specimens of *Neobulimina canadensis* are usually present. The *Anomalina* is not restricted to this zone

but in no other part of the section is it so abundant. This zone is only of local occurrence, but it has been very useful in structure core drilling over several townships south of Derwent. It is difficult to recognize in rotary samples, however, because the specimens are disseminated and their characteristic abundance may not be apparent.

The upper part of the Lea Park shale is mostly barren. However, *Bulimina venusae*, n. sp., is common at a horizon about 30 feet below the top of the formation.

The radiolarian, *Dictyomitra multicostata* Zittel is an interesting species in the Lea Park shale. It is not restricted to the Lea Park, but it is most abundant in the middle of that formation. It is nearly always pyritized. Although it is widespread in occurrence throughout Alberta, Saskatchewan and Manitoba (Campbell and Clark, 1944) it has been recorded from North America only twice before.

The faunas of the marine shale tongues above the Lea Park are not ideally distinctive, but along with other stratigraphic data, they do help to identify the various units. *Haplophragmoides rota* Nauss, n. sp., and *Cytheridea canadensis* Scott, n. sp., are most abundant in the Grizzly bear tongue.

LIST OF MICROFOSSILS

The following is a list of the more important microfossils that occur in each stratigraphic unit in the Vermilion area:

Mulga tongue

Haplophragmoides rota Nauss, n. sp.

Grizzly Bear tongue

Cytheridea canadensis Scott, n. sp.
Haplophragmoides rota Nauss, n. sp.
Lamarckina sp.
Quinqueloculina sp.

Vanesti tongue

Bulimina venusae Nauss, n. sp.
Cytheridea canadensis Scott, n. sp.
Gyroidina sp.
Haplophragmoides cf. *H. excavata* Cushman and Waters.
Haplophragmoides rota Nauss, n. sp.
Haplophragmoides sp.
Lagena sp.
Nonionella austinana Cushman.
Textularia cf. *T. ripleyensis* Berry.

Lea Park shale

Ammodiscus sp.
Anomalina solis Nauss, n. sp.
Anomalina talaria Nauss, n. sp.
Bathysiphon vitta Nauss, n. sp.
Bolivina elkensis Nauss, n. sp.
Bulimina venusae Nauss, n. sp.
Cytheridea sp.
Dentalina sp.
Dictyomitra multicostata Zittel.
Epistomina fax Nauss, n. sp.
Gaudryina painoides Wickenden.
Gaudryina sp.
Globigerina cf. *G. cretacea* d'Orbigny.
Globigerinella aspera (Ehrenberg)
Gümbelina sp.
Gyroidina sp.
Haplophragmoides kirki Wickenden.
Haplophragmoides sp.
Neobulimina canadensis Cushman and Wickenden.
Nodosaria sp.
Quinqueloculina sphaera Nauss, n. sp.
Robulus sp.
Trochammina ribstonensis Wickenden.
Verneulina cf. *V. bearpawensis* Wickenden.

Lloydminster shale

Ammobaculites fragmentaria Cushman.
Ammobaculites humei Nauss, n. sp.
Ammobaculites tyrrelli Nauss, n. sp.
Ammodiscus sp.
"Bigenerina" angulata Cushman.
Dictyomitra multicostata Zittel.
Gaudryina hectori Nauss, n. sp.
Globigerina cretacea d'Orbigny.
Globigerina loetterli Nauss, n. sp.
Gümbelina globulosa (Ehrenberg).
Haplophragmoides collyra Nauss, n. sp.
Haplophragmoides excavata Cushman and Waters.
Haplophragmoides linki Nauss, n. sp.
Haplophragmoides gigas Cushman.
Haplophragmoides sp.
Miliammina manitobensis Wickenden.
Tritaxia sp.
Verneuilina canadensis Cushman.

Cummings member of Mannville formation

Ammobaculites fragmentaria Cushman.
Ammobaculites humei Nauss, n. sp.
"Bigenerina" angulata Cushman.
Haplophragmoides gigas minor Nauss, n. subsp.
Haplophragmoides linki Nauss, n. sp.
Miliammina sproulei Nauss, n. sp.
"Verneuilina" cummingensis Nauss, n. sp.

ARRANGEMENT OF DESCRIPTIONS

Species are customarily arranged in the order of their presumed evolutionary development. Ideas concerning evolution of the Foraminifera are continually changing, however, and no two arrangements are likely to be the same. In works without an index it is sometimes necessary to thumb through the entire article to find the description of one fossil in which the reader is interested. The following arrangement,

therefore, is alphabetical according to genera in order to facilitate the finding of individual descriptions.

DESCRIPTIONS OF FOSSILS

Order FORAMINIFERA

Genus AMMOBACULITES Cushman, 1910

AMMOBACULITES HUMEI Nauss, n. sp.

Plate 48, figure 1

Test not compressed, earlier portion close-coiled, later four or five chambers in a straight cylindrical series; chambers increasing slightly in diameter as added, last chamber pyriform; sutures depressed, indistinct; wall arenaceous, many angular grains of clear quartz up to 0.1 mm. in size in a small amount of siliceous cement; aperture terminal, possibly elliptical.

Length, holotype 0.93 mm., paratypes up to 1.0 mm.; diameter of coiled portion, holotype 0.2 mm.; greatest width, holotype 0.27 mm.

Type locality.—Northwest Mannville Well No. 1 in Legal subdivision 1, sec. 18, T. 50, R. 8, W. 4th. meridian at a depth of 2173–2182 feet, from 5–15 feet above base of Cummings member of Mannville formation.

Holotype.—Stanford Univ. Pal. Type Coll., no. 7927.

Comparisons.—This species most closely resembles *A. subcretacea* Cushman and Alexander (1930) from the Lower Cretaceous Goodland formation of Texas. It differs from that species in that there are four or five chambers in the uniserial portion rather than three or four. The maximum length of the Canadian specimens is 1.0 mm., whereas the Texas species does not exceed 0.7 mm. Finally, the new species is not compressed.

AMMOBACULITES TYRRELLI Nauss, n. sp.

Plate 48, figure 2

Ammobaculites coprolithiforme, CUSHMAN, 1927b.

Test elongate, early portion coiled involute, later uniserial, circular in section; chambers four in coiled part, three to five in uniserial portion; sutures distinct, at right angles to long axis, depressed; wall arenacequs, smoothly finished, last chamber often less smoothly finished than others, grains angular; aperture elliptical, terminal, at end of a pronounced neck, which is broken off in most specimens.

Length, holotype 0.7 mm., paratypes 0.4–0.75 mm.; width, holotype 0.2 mm., paratypes 0.15–0.22 mm.

Holotype.—Stanford Univ. Pal. Type Coll., no. 7928.

Type locality.—Dina Omega Well No. 1 in Legal subdivision 14, sec. 9, T. 45, R. 1, W. 4th meridian at a depth of 1478–1488 feet, 17–27 feet above the base of the Lloydminster shale.

Comparisons.—This species is similar to *A. coprolithiforme* Schwager from the Jurassic of Germany in the shape of the last chamber, in being smoothly finished, and in having distinct sutures, but the Canadian specimens are more circular in outline of coiled portion, the sutures are at right angles to the long axis of the test, and apertural necks are characteristic.

Genus ANOMALINA d'Orbigny 1826

ANOMALINA SOLIS Nauss, n. sp.

Plate 49, figure 9 a–c

Test nearly planispiral, compressed, disc-shaped, later whorls becoming partially evolute, umbonate, with bosses of white shell material on both sides; periphery narrowly rounded, without keel; chambers distinct, 11 to 14 in last whorl, uniform, gradually increasing in size as added; sutures distinct, limbate, curved, flush with the surface or raised in early stages, depressed in later stages; wall calcareous, perforate; aperture elongate, extending from periphery along base of last septal face to umbilicus and curving around umbilicus along umbilical margin of last 3–8 chambers.

Greatest diameter, holotype 0.31 mm., paratypes 0.2–0.5 mm.; least diameter, holotype 0.25 mm., paratypes 0.18–0.4 mm.; thickness, holotype 0.1 mm., paratypes 0.08–0.2 mm.

Holotype.—Stanford Univ. Pal. Type Coll., no. 7929.

Type locality.—Imperial Core Test No. 82 in Legal subdivision 16, sec. 24, T. 56, R. 7, W. 4th meridian at a depth of 420–425 feet, about 40 feet above the base of the Lea Park shale.

Comparisons.—This species is similar to *A. taylorensis* Carsey (1926) in its compressed shape, tendency to become evolute, umbilical bosses, raised sutures in the early stages, and depressed sutures in the later

stages. It differs in its lack of a keel and its more rounded periphery.

ANOMALINA TALARIA Nauss, n. sp.
Plate 48, figures 11 a–c, 12 a–c

Test nearly biconvex, nearly involute on one side, somewhat evolute on the other, later stages becoming more evolute; periphery rounded; chambers closely appressed, about nine in last whorl, distinct; sutures slightly limbate, depressed, curved; wall calcareous, hyaline, finely perforate; aperture an arched slit on the periphery extending onto ventral side along the umbilical edge of the last four or five chambers, where it is bordered by an irregular lip or flange.

Greatest diameter, holotype 0.25 mm., paratypes 0.11–0.26 mm.; least diameter, holotype 0.21 mm., paratypes 0.1–0.23 mm.; thickness, holotype 0.08 mm., paratypes 0.07–0.08 mm.

Holotype.—Stanford Univ. Pal. Type Coll., no. 7930.

Type locality.—Imperial Core Test No. 27 in Legal subdivision 1, sec. 4, T. 54, R. 8, W. 4th meridian at a depth of 260–270 feet, 190–200 feet below top of Lea Park shale. Figured paratypes from Vermilata Frankview Well No. 1 between the depths 490–500 feet, 420–430 feet above the base of the Lea Park shale.

Comparisons.—This species is similar in general aspect and aperture to *A. complanata* Reuss of Cushman from the Cretaceous of Tennessee. It differs from that species in its smaller size, fewer chambers and more rounded periphery.

Genus BATHYSIPHON M. Sars, 1872
BATHYSIPHON VITTA Nauss, n. sp.
Plate 48, figure 4

Test a compressed tube, open at both ends, with indistinct constrictions at regular intervals; lateral edges broadly rounded; wall 0.07 mm. thick, composed of minute clear grains nearly joined in a white amorphous cement, covered with a black coating.

Length of one section, holotype 1.0 mm.; width, holotype 0.47 mm.; thickness, holotype 0.2 mm.

Holotype.—Stanford Univ. Pal. Type Coll., no. 7931.

Type locality.—Imperial Core Test No. 83 in Legal subdivision 4, sec. 4, T. 56, R. 5, W. 4th meridian, at a depth of 265–270 feet, about 270 feet above the base of the Lea Park shale.

Comparisons.—This species is similar to *B. eocenica* Cushman and Hanna (1927) from the Eocene near Coalinga, California. It differs in having a thinner wall and being more compressed. These specimens also have a black coating whereas specimens of *B. eocenica* from several localities in California are partly covered with a red coating, which seems to be a fairly constant feature.

Genus BOLIVINA d'Orbigny, 1839
BOLIVINA ELKENSIS Nauss, n. sp.
Plate 48, figure 7 a, b

Test elongate, tapering, greatest width near the apertural end, biserial throughout, slightly twisted and compressed; edges broadly rounded; chambers distinct, inflated, fifteen in holotype; sutures depressed, distinct, at right angles to long axis of test in early stages, becoming oblique in later stages; wall smooth, finely perforate; aperture elliptical, extending from the end of last chamber to its inner margin.

Length, holotype 0.27 mm., paratypes 0.18–0.33 mm.; width, holotype 0.11 mm., paratypes 0.05–0.11 mm.; thickness, holotype 0.07 mm., paratypes 0.05–0.07 mm.

Holotype.—Stanford Univ. Paleo. Type Coll., no. 7932.

Type locality.—Imperial Core Test No. 73, in Elk Point, Legal subdivision 9, sec. 1, T. 57, R. 7, W. 4th meridian at a depth of 285–290 feet, about 360 feet above the base of the Lea Park shale.

Comparisons.—This species is similar to *Virgulina tegulata* Reuss in number and shape of chambers and character of sutures. It is biserial from the initial chamber, increases in size more rapidly, and has a larger and wider aperture than the German species.

Because it is biserial throughout, has an aperture parallel to the compression of the test at the base of the septum rather than terminal, and because the test is oval in cross section, this species is assigned to *Bolivina*.

Genus BULIMINA d'Orbigny, 1826
BULIMINA VENUSAE Nauss, n. sp.
Plate 48, figure 10

Test conical, composed of about five whorls, angle of taper of holotype 38°, para-

types 23°–45°; cross section circular; chambers inflated, 12–15 in number; sutures distinct, depressed; wall smooth, calcareous, hyaline, finely perforate; aperture a comma-shaped opening on the inner face of the last chamber.

Length, holotype 0.22 mm., paratypes 0.15–0.26 mm.; greatest diameter, holotype 0.12 mm., paratypes 0.07–0.13 mm.

Holotype.—Stanford Univ. Pal. Type Coll., no. 7933.

Type locality.—Imperial Core Test No. 7, in Legal subdivision 11, sec. 8, T. 51, R. 7, W. 4th. meridian at a depth of 125 feet, about 15 feet above the base of the Vanesti tongue.

Range.—This species also occurs in Battleview Syndicate Test Hole No. 6A between the depths 70 and 110 feet. It is a common species in the marine clay shales of the Vanesti tongue and upper Lea Park shale.

Comparisons.—This species is similar to *B. reussi navarroensis* Cushman and Parker (1935) from the Upper Cretaceous Navarro of Texas. The latter differs in that its angle of taper is about 53°.

Genus EPISTOMINA Terquem, 1883
EPISTOMINA FAX Nauss, n. sp.
Plate 48, figures 15, 16 a–c

Epistomina caracolla, WICKENDEN, 1941.

Test biconvex, dorsal side gently convex, evolute, ventral side subconical, involute; periphery acute, slightly keeled; chambers distinct, closely appressed, six to eight in last whorl, commonly seven, not inflated, of uniform shape, gradually increasing in size; sutures limbate, flush with surface, curved on dorsal side, straight and slightly oblique on ventral side; wall calcareous, hyaline, smooth, finely perforate, with a pattern of light and dark caused by internal septa; primary aperture a short slit at base of last septal face, near periphery, with a lip on outer margin; secondary aperture an elongate slit on last septal face near and parallel to periphery and extending to primary aperture, usually filled with clear shell material.

Greatest diameter, holotype 0.4 mm., paratypes 0.2–0.6 mm.; least diameter, holotype 0.35 mm., paratypes 0.17–0.53 mm.; thickness, holotype 0.23 mm., paratypes 0.13–0.4 mm.

Holotype.—Stanford Univ. Pal. Type Coll., no. 7934; paratype no. 7935.

Type locality.—Vermilata Frankview Well No. 1 in Legal subdivision 16, sec. 28, T. 50, R. 5, W. 4th meridian from 660–670 feet, 180–190 feet above the base of the Lea Park shale.

Range.—This species is restricted to the lower 200 to 300 feet of the Lea Park shale of the Canadian plains (Wickenden 1932C).

Comparisons.—This species and related American forms have been described generally under the name *E. caracolla* (Roemer). A comparison of European specimens and the type figure of this species with material from several localities in North America demonstrates that the name *caracolla* has been too widely applied.

This species is similar to *E. "caracolla"* Cushman (not Roemer) from the Upper Cretaceous Coon Creek formation of Tennessee. It differs from Coon Creek specimens in lacking an umbo, in being flatter on the dorsal side, and in having a less pronounced keel. In *E. "caracolla"* Cushman and Church from the Upper Cretaceous of California the ventral umbo is especially well developed. Morphologically, Coon Creek specimens are more similar to *E. fax* than are those from California.

Genus GAUDRYINA d'Orbigny 1839
GAUDRYINA HECTORI Nauss, n. sp.
Plate 48, figure 6 a, b

Test elongate, curved, early portion triserial, later biserial and twisted, roundly elliptical in cross section of biserial stage, roughly triangular in triserial stage; chambers subglobular, about nine in triserial chambers, 10 in biserial portion; sutures distinct, depressed, at right angles to long axis, forming a zig-zag line at contact between two rows of chambers; wall arenaceous, grains 0.01 mm. in diameter; aperture a high arched slit at base of apertural face of last chamber, 0.07 mm. high and 0.99 mm. long.

Length, holotype 0.7 mm., paratypes 0.5–0.9 mm.; width, holotype 0.2 mm., paratypes 0.1–0.25 mm.

Holotype.—Stanford Univ. Pal. Type Coll., no. 7936.

Type locality.—Northwest Mannville Well No. 1 in Legal subdivision 1, sec. 18,

T. 50, R. 8, W. 4th. meridian from a depth of 1806–1813 feet, 20–25 feet above the base of the Lloydminster shale.

Comparisons.—This species is similar to *G. filiformis* Berthelin from the Albian of Montcley, France, in that it is the same size, twisted, has sutures at right angles to the long axis, and subglobular chambers but it has fewer chambers, a narrower aperture, and is more twisted.

Genus GLOBIGERINA d'Orbigny 1826

GLOBIGERINA LOETTERLI Nauss, n. sp.

Plate 49, figure 11 a–c

Test rotaliform, dorsal side convex, ventral side umbilicate; periphery rounded; chambers subglobular, closely appressed (for the genus), six or seven in last whorl, in gerontic specimens ultimate and penultimate chambers sometimes smaller than antepenultimate; sutures distinct, depressed, slightly curved; wall calcareous, finely perforate; aperture opening into umbilicus, almost invariably obscured by foreign material.

Greatest diameter, holotype 0.5 mm., paratypes 0.4–0.7 mm.; least diameter, holotype 0.4 mm., paratypes 0.3–0.6 mm.; thickness, holotype 0.25 mm., paratypes 0.2–0.4 mm.

Holotype.—Stanford Univ. Pal. Type Coll., no. 7937.

Type locality.—Clonmel Well No. 1 in Legal subdivision 1, sec. 32, T. 55, R. 20, W. 4th meridian, west of the Vermilion area, between the depths of 1875–1885 feet, 485–495 feet below the top of the Lloydminster shale.

Range.—"Floods" of this species are characteristic of the central part of the Lloydminster shale where the species is associated with a few specimens of *Gümbelina globulosa* (Ehrenberg). It has been encountered in this zone in wells in the Vermilion area, in southern Alberta and in an outcrop at Green Lake 112 miles northeast of Lloydminster.

EXPLANATION OF PLATE 48

FIGS. *1*—*Ammobaculites humei* Nauss, n. sp. Holotype, ×40, from Northwest Mannville Well No. 1 at a depth of 2173–2182 feet; Mannville formation. (p. 333)

2—*Ammobaculites tyrrelli* Nauss, n. sp. Holotype, ×40, from Dina Omega Well No. 1 at a depth of 1478–1488 feet; Lloydminster shale. (p. 333)

3, 8—*Dictyomitra multicostata* Zittel, ×80. *3*, Hypotype, from Imperial Core Test No. 69 at a depth of 420 feet; *8*, an eroded specimen from Vermilata Frankview Well No. 1 at a depth of 570–580 feet; Lea Park shale. (p. 341)

4—*Bathysiphon vitta* Nauss, n. sp. Holotype, ×40, from Imperial Core Test No. 83 at a depth of 265–270 feet; Lea Park shale. (p. 334)

5—*Neobulimina canadensis* Cushman and Wickenden, ×80, from Imperial Core Test No. 82 at a depth of 50 feet; Lea Park Shale. *a*, side view, *b*, apertural view. (p. 340)

6—*Gaudryina hectori* Nauss, n. sp. Holotype, ×56, from Northwest Mannsville Well No. 1 at a depth of 1806–1813 feet; Lloydminster shale. *a*, side view, *b*, apertural view. (p. 335)

7—*Bolivina elkensis* Nauss, n. sp. Holotype, ×85, from Imperial Core Test No. 73 at a depth of 285–290 feet; Lea Park shale. *a*, side view, *b*, apertural view. (p. 334)

9—*Globigerinella aspera* (Ehrenberg), ×78, from Vermilata Frankview Well No. 1 at a depth of 620 feet; Lea Park shale. *a*, side view, *b*, apertural view. (p. 337)

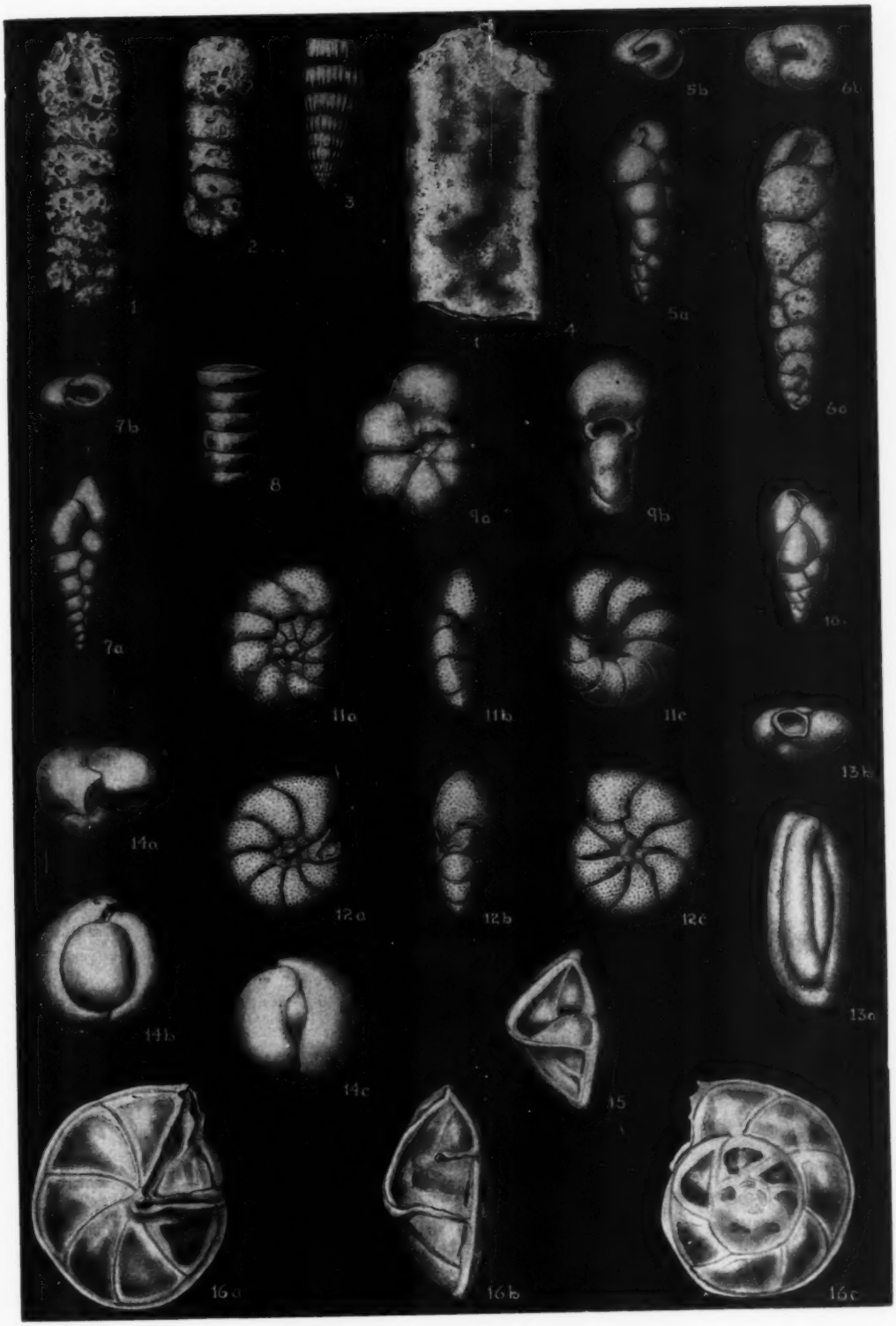
10—*Bulimina venusae* Nauss, n. sp. Holotype, ×82, from Imperial Core Test No. 7 at a depth of 125 feet; Vanesti tongue. (p. 334)

11, 12—*Anomalina talaria* Nauss, n. sp., ×80. *11*, Holotype, from Imperial Core Test No. 27, at a depth of 260–270 feet; Lea Park shale. *a*, dorsal view, *b*, apertural view, *c*, ventral view, *12*, Paratype from Vermilata Frankview Well No. 1 at a depth of 490–500 feet, *a*, dorsal view, *b*, apertural view, *c*, ventral view. (p. 334)

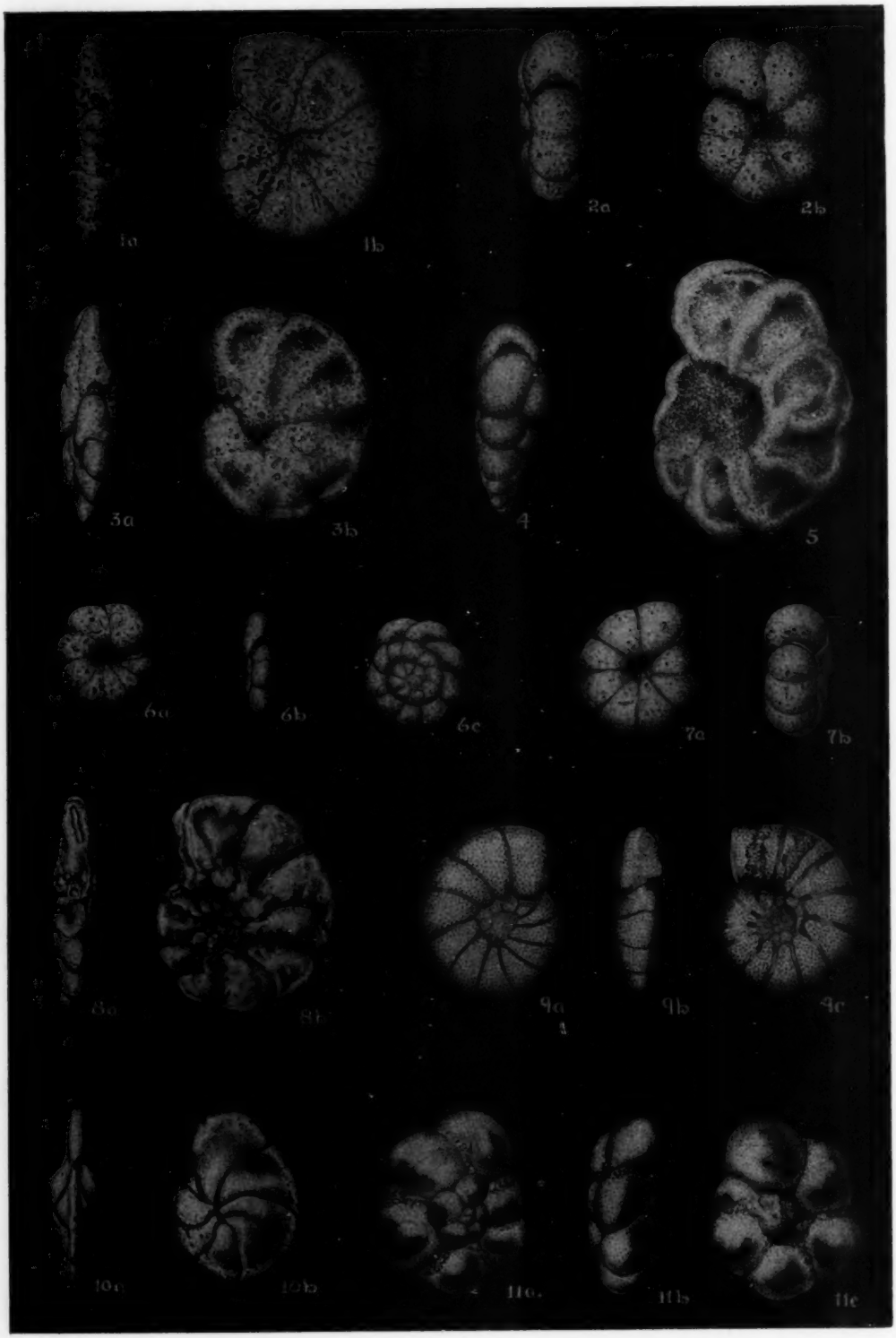
13—*Miliammina sproulei* Nauss, n. sp. Holotype, ×58, from Northwest Mannville Well No. 1 at a depth of 2152–2162 feet; Cummings member of Mannville formation. *a*, side view, *b*, apertural view. (p. 339)

14—*Quinqueloculina sphaera* Nauss, n. sp. Holotype, ×72, from Vermilata Frankview Well No. 1 at a depth of 630–640 feet; Lea Park shale. *b* and *c*, opposite sides; *a*, apertural view. (p. 340)

15, 16—*Epistomina fax* Nauss, n. sp., ×75. *15*, Paratype, from Imperial Core Test No. 69 at a depth of 210–220 feet; apertural view showing primary aperture, *16*, Holotype, from Vermilata Frankview Well No. 1 at a depth of 660–670 feet; *a*, ventral view, *b*, apertural view, showing secondary aperture, *c*, dorsal view. Lea Park shale. (p. 335)



Nauss – Cretaceous Microfossils



Nauss – Cretaceous Microfossils

Comparisons.—This species is similar to *G. belli* White (1928) in having generally six chambers in the last whorl, and in being the same size. It differs in having subglobular chambers, a large umbilicus, and the last two chambers smaller than the antepenultimate chamber in many specimens. The young stages of *G. loetterli* have a number of characters in common with *G. cretacea* d'Orbigny, from which it may have evolved.

Genus GLOBIGERINELLA Cushman 1927
GLOBIGERINELLA ASPERA (Ehrenberg)
Plate 48, figure 9 a, b

Test planispirally coiled in the adult, tending to become more evolute in adult; periphery broadly rounded; chambers inflated, globular, six to eight in last whorl; sutures distinct, depressed, straight radiate; wall calcareous, finely perforate, hispid in more perfectly preserved specimens; aperture a high arched slit at base of septal face of last-formed chamber, bordered by a well-developed lip.

Greatest diameter, hypotype 0.27 mm., other specimens 0.2–0.3 mm.; least diameter, hypotype 0.2 mm., other specimens 0.15-0.25 mm.; thickness, hypotype 0.13 mm., other specimens 0.09–0.15 mm.

Hypotype.—Stanford Univ. Pal. Type Coll., no. 7938.

Locality of hypotype.—Vermilata Frankview Well No. 1, in Legal subdivision 16, sec. 28, T. 50, R. 5, W. 4th meridian at a depth of 620 feet, 230 feet above the base of the Lea Park shale.

Range.—This species also occurs sparingly in many wells and core tests from 200–300 feet above the base of the Lea Park shale.

Remarks.—The holotype of this species was figured by Ehrenberg as seen by transmitted light and its nature, therefore, is imperfectly known. The Canadian specimens have been assigned provisionally to this species and are figured because of their stratigraphic importance.

Genus HAPLOPHRAGMOIDES Cushman, 1910
HAPLOPHRAGMOIDES COLLYRA Nauss, n. sp.
Plate 49, figures 2a, b, 5

Test planispiral, nearly involute, tending to become evolute in later stages; periphery broadly rounded; chambers seven to ten in last whorl, inflated, globular, but usually flattened by compression so that chambers may be concave; sutures distinct, depressed, radial, straight; wall arenaceous, of numerous grains 0.01 mm. in diameter in a small amount of cement; aperture a high arched slit at base of apertural face of last formed chamber (0.15 mm. long and 0.07

EXPLANATION OF PLATE 49

FIGS. *1, 3*—*Haplophragmoides rota* Nauss, n. sp., ×44. *1*, Holotype, from Imperial Core Test No. 14 at a depth of 55–60 feet; *a*, peripheral view, *b*, side view. *3*, Paratype, from Imperial Core Test No. 2 at a depth of 190–200 feet; *a*, peripheral view, *b*, side view. Grizzly Bear shale. (p. 339)

2, 5—*Haplophragmoides collyra* Nauss, n. sp., ×50. *2*, Holotype, from Clonmel Well No. 1 from a depth of 1765–1788; *a*, apertural view, *b*, side view. *5*, Side view of crushed paratype from same locality. Lloydminster shale. (p. 337)

4—*"Verneuilina" cummingersis* Nauss, n. sp. Holotype, ×65, from Northwest Mannville Well No. 1 at a depth of 2152–2162 feet; Cummings member. (p. 341)

6—*Trochammina ribstonensis* Wickenden. Hypotype, ×80, from Imperial Core Test No. 72 at a depth of 450–460; Lea Park shale. *a*, ventral view, *b*, peripheral view, *c*, dorsal view. (p. 340)

7—*Haplophragmoides linki* Nauss, n. sp. Holotype, ×55, from Dina Omega Well No. 1, at a depth of 1478–1488 feet; Lloydminster shale. *a*, side view, *b*, apertural view. (p. 339)

8—*Haplophragmoides gigas* Cushman. Hypotype, ×29, from Midfield Well No. 1 at 1615–1620 feet; Lloydminster shale. *a*, peripheral view; *b*, side view. (p. 338)

9—*Anomalina solis* Nauss, n. sp. Holotype, ×74, from Imperial Core Test No. 82 at a depth of 420–425 feet; Lea Park shale. *a*, dorsal view, *b*, peripheral view, *c*, ventral view. (p. 333)

10—*Haplophragmoides gigas minor* Nauss, n. var. Holotype, ×55, from Northwest Mannville Well No. 1 at a depth of 2173–2183 feet; Cummings member of Mannville formations. *a*, peripheral view, *b*, side view. (p. 338)

11—*Globigerina loetterli* Nauss, n. sp. Holotype, ×48, from Clonmel Well No. 1 at a depth of 1875–1885 feet; Lloydminister shale. *a*, dorsal view, *b*, peripheral view, *c*, ventral view. (p. 336)

All types are in the Stanford University Paleontology Type Collection.

mm. high in holotype); color light to brownish grey.

Greatest diameter, holotype 0.46 mm., paratypes 0.35-0.95 mm.; least diameter, holotype 0.33 mm., paratypes 0.3–0.75 mm.; thickness, holotype 0.15 mm., paratypes 0.07-0.02 mm.

Holotype.—Stanford Univ. Pal. Type Coll., no. 7939; paratype no. 7940.

Type Locality.—Clonmel Well No. 1, in Legal subdivision 1, sec. 32, T. 55, R. 20, W.

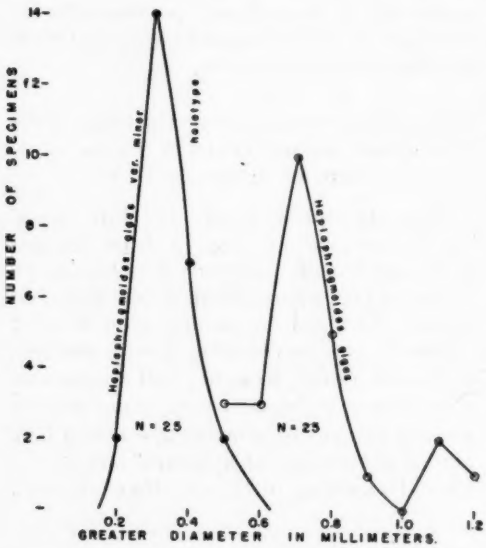


FIG. 2—Frequency chart showing distribution of greater diameter measurements in millimeters for 25 specimens of *Haplophragmoides gigas minor* Nauss, n. var., and *Haplophragmoides gigas* Cushman.

4th meridian at a depth of 1765–1788 feet, 375–398 feet below top of the Lloydminster shale.

Comparisons.—This species is similar to *H. fraseri* Wickenden (1932A) from the Bearpaw of southern Alberta in being umbilicate, in having about the same number of chambers, and in being slightly evolute. It differs in not being evolute in younger stages, in having more globular chambers and a more strongly arched aperture. It may have evolved into the more evolute *H. fraseri.*

Most of the Alberta specimens have been deformed by compaction (plate 49, figure 5) but some have their chambers filled with pyrite and retain their original shape. A small undeformed specimen has been chosen as holotype.

HAPLOPHRAGMOIDES GIGAS Cushman, 1927
Plate 49, figure 8 a, b

Test planispiral, compressed, becoming slightly evolute in later stages; periphery narrowly rounded; chambers about 10 in last whorl, with an elongate lobe extending toward umbilicus; sutures sigmoid, distinct, depressed, slightly limbate; wall arenaceous, grains 0.05 mm. in diameter; aperture "peripheral at the base of the apertural face with a slight lip" (Cushman 1927b).

Greatest diameter, hypotype 1 mm., least diameter 0.87 mm., thickness 0.1 mm.; see figure 2 for greater diameter of other specimens.

Hypotype.—Stanford Univ. Pal. Type Coll., no. 7941.

Locality of hypotype.—Midfield Well No. 1 in Legal subdivision 16, sec. 14, T. 50, R. 6, W. 4th meridian at a depth of 1615–1620 feet, about 15 feet above the base of the Lloydminster shale.

HAPLOPHRAGMOIDES GIGAS MINOR
Nauss, n. var.
Plate 49, figure 10 a, b

Test planispiral, involute, compressed, umbilicate, thickest part of test around umbilicus; periphery subacute; each chamber with a narrow lobe extending toward umbilicus, 8–11 in last whorl; sutures slightly depressed, indistinct, sigmoidal; wall agglutinated, grains 0.02 mm. in diameter, embedded in siliceous cement; aperture an arched slit at base of last septal face, usually obscured.

Diameter, holotype 0.4 mm., paratypes 0.2–0.5 mm.; thickness, holotype 0.14 mm.

Holotype.—Stanford Univ. Pal. Type Coll., no. 7942.

Type locality.—Northwest Mannville Well No. 1 in Legal subdivision 1, sec. 18, T. 50, R. 8, W. 4th. meridian from a depth of 2173–2183 feet, from 5–15 feet above base of Cummings member of the Mannville formation.

Comparisons.—This variety differs from *H. gigas gigas* Cushman (1927b) in its smaller size, less pronounced umbilical lobes of chambers, and the lack of a tendency to become evolute in later stages.

HAPLOPHRAGMOIDES LINKI Nauss, n. sp.
Plate 49, figure 7 a, b

Haplophragmoides rugosa, Cushman, 1927b.

Test involute, planispiral, deeply umbilicate; periphery broadly rounded; chambers distinct, six to eight in last whorl; sutures depressed, radial; wall arenaceous, with grains 0.01 mm. in diameter; aperture a low arched slit (0.025 mm. high, 0.07 mm. long on holotype) at base of apertural face; color usually dark grey.

Greatest diameter, holotype 0.33 mm., paratypes 0.26–0.46 mm.; least diameter, holotype 0.27 mm., paratypes 0.25–0.4 mm.; thickness, holotype 0.13 mm., paratypes 0.1–0.2 mm.

Holotype.—Stanford Univ. Pal. Type Coll., no. 7943.

Type locality.—Dina Omega Well No. 1, in Legal subdivision 14, sec. 9, T. 45, R. 1, W. 4th meridian from a depth of 1478–1488 feet, 17–27 feet above the base of the Lloydminster shale.

Comparisons.—This species resembles *H. rugosa* Cushman and Waters (1926) only in being deeply umbilicate, involute, dark-colored, and having about seven chambers. The Canadian specimens are smaller, composed of finer sand grains, and the sutures are more distinct.

HAPLOPHRAGMOIDES ROTA Nauss, n. sp.
Plate 49, figures 1 a, b, 3 a, b

Test planispiral, involute, compressed, last two or three chambers tending to become evolute, slightly umbilicate; periphery narrowly rounded; chambers triangular in outline, closely appressed, central parts usually depressed, eight or nine in last whorl; sutures commonly indistinct, slightly depressed or even with surface; wall arenaceous, neatly joined abundant grains 0.01 mm. in diameter embedded in a small amount of cement; aperture a low arched slit at base of septal face of last formed chamber.

Greatest diameter, holotype 0.68 mm., paratypes 0.4–0.9 mm.; least diameter, holotype 0.55 mm., paratypes 0.33–0.73 mm.; thickness, holotype 0.2 mm., paratypes 0.1–0.26 mm.

Holotype.—Stanford Univ. Pal. Type Coll., no. 7944; paratype no. 7945.

Type locality.—Imperial Core Test No. 14, in Legal subdivision 5, sec. 7, R. 51, R. 8, W. 4th meridian at a depth of 55–60 feet, about 10–15 feet above the base of the Grizzly Bear tongue.

Range.—This species occurs abundantly in the lower 20 feet of the Grizzly Bear shale.

Comparisons.—This species is roughly similar to *H. excavata* Cushman and Waters (1926) from the Navarro formation of Texas but does not have such concave chambers, is larger, has a small umbilicus, and tends to become evolute in its later stages.

Genus MILIAMMINA Heron-Allen and Earland, 1930

MILIAMMINA SPROULEI Nauss, n. sp.
Plate 48, figure 13 a,b

Test roughly triangular in cross section; chambers tubular, distinct, commonly four visible on one side and three on the other; sutures distinct, depressed; wall arenaceous, smooth, fine grains in a siliceous cement: aperture a round opening without a tooth at the end of last chamber, on a short neck with a phialine lip; color grey.

Length, holotype 0.47 mm., paratypes 0.27–0.9 mm.; width, holotype 0.2 mm., paratypes 0.1–0.4 mm.

Holotype.—Stanford Univ. Pal. Type Coll., no. 7946.

Type locality.—Northwest Mannville Well No. 1, in Legal subdivision 1, sec. 18, T. 50, R. 8, W. 4th meridian at a depth of 2152–2162 feet.

Range.—Specimens of this species have been found only in the Cummings member of the Mannville formation in the Vermilion area.

Comparisons.—This species is similar to *M. manitobensis* Wickenden (1932a), from which it differs in its more slender shell, and larger aperture.

Genus NEOBULIMINA Cushman and Wickenden, 1928

NEOBULIMINA CANADENSIS Cushman and Wickenden, 1928

Plate 48, figure 5 a,b

Test elongate, triserial in early stages becoming biserial in adult; edges broadly rounded; chambers inflated, globular, 7 to 16 in biserial portion, 12 to 16 in triserial portion; sutures distinct, depressed; wall calcareous, coarsely perforate, in some specimens has hispid appearance; aperture oval, extending to base of last chamber.

Length of hypotype 0.31 mm., width 0.11 mm.

Holotype.—National Museum of Canada.

Hypotype.—Stanford Univ. Pal. Type Coll., no. 7947.

Type locality.—Imperial Ribstone Well No. 1, in Legal subdivision 6, sec. 6, T. 45, R. 1, W. 4th meridian at a depth of 360–370 feet, about 360 feet above the base of the Lea Park shale.

Range.—The hypotype figured here is from Imperial Core Test No. 82 in Legal subdivision 1, sec. 25, T. 56, R. 7, W. 4th meridian at a depth of 50 feet, 410 feet above the base of the Lea Park formation. The species ranges from 200 feet below the top to 200 feet above the base.

Genus QUINQUELOCULINA d'Orbigny, 1846

QUINQUELOCULINA SPHAERA Nauss, n. sp.

Plate 48, figure 14 a–c

Test circular in side view, subtriangular in end view; edges broadly rounded; chambers inflated, four visible from one side (only small portion of fourth chamber showing), three on the other; sutures distinct, depressed; wall smooth, porcellanous, imperforate; aperture an arched slit at end of last formed chamber.

Length, holotype 0.25 mm.; width, holotype, 0.22 mm.; thickness, holotype 0.22 mm.

Holotype.—Stanford Univ. Pal. Type Coll., no. 7948.

Type locality.—Vermilata Frankview Well No. 1, in Legal subdivision 16, sec. 28, T. 50, R. 5, W. 4th meridian at a depth of 630–640 feet, 220 feet above the base of the Lea Park shale.

Comparisons.—This species is similar to *Q. rotunda* Carsey (1926) from the Navarro of Texas but differs in its smaller size and more circular outline in side view.

Genus TROCHAMMINA Parker and Jones, 1859

TROCHAMMINA RIBSTONENSIS Wickenden (1932a)

Plate 49, figure 6 a-c

Test very small, trochoid, umbilical area open; periphery subangular; chambers subglobular, six to ten in last formed whorl; sutures curved and depressed on dorsal side, nearly radiate and straight on ventral side; wall finely agglutinated; aperture a low arched slit on inner margin of ventral side of last formed chamber.

Diameter 0.17–0.28 mm., thickness 0.07–0.13 mm.

Type locality.—Imperial Ribstone Well No. 1, in Legal subdivision 6, sec. 6, T. 45, R. 1, W. 4th meridian at a depth of 700 feet below the surface. Other specimens from 680–720 feet in the same well.

Range.—This species is restricted to the lower 40 feet of the Lea Park shale in the Vermilion area.

Hypotype.—Stanford Univ. Pal. Type Coll., no. 7949.

Because of its restricted range, this species is an excellent guide fossil in the Vermilion area.

Genus VERNEUILINA d'Orbigny

The genotype of *Verneuilina* is triangular in cross section with sharp angles and flat or concave sides. In the Cretaceous strata of Canada a series of arenaceous forms occur which have a tendency to become less triangular in cross section and to develop a *Buliminella*-like arrangement of chambers. These tendencies culminate in *V. bearpawensis* Wickenden. This form series, or bioseries, has a parallel in the calcareous family Buliminidae (see Cushman, 1940, text figs. in plate 22). Further study may reveal that these arenaceous Foraminifera with subcircular cross sections should be considered a new genus with *V. bearpawensis* as genotype. However, they are tentatively included in the genus *Verneuilina* as time has not permitted an exhaustive study of material from widely separated localities.

"VERNEUILINA" CUMMINGENSIS
Nauss, n. sp.
Plate 49, figure 4

Test triserial, elongate, tapering, subcircular in cross section; edges broadly rounded; chambers inflated, 12 to 15 in number, subglobular; sutures distinct, depressed; wall arenaceous, grains about 0.01 mm. in diameter; aperture an arched slit at base of apertural face of last chamber.

Length, holotype 0.4 mm., paratypes 0.3–0.5 mm.; width (at widest part), holotype 0.16 mm., paratypes 0.13–0.17 mm.

Holotype.—Stanford Univ. Pal. Type Coll., no. 7950.

Type locality.—Northwest Mannville Well No. 1, in Legal subdivision 1, sec. 18, T. 50, R. 8, W. 4th meridian between the depths 2152–2162 feet, in the Cummings member.

Comparisons.—This species is similar to *V. bearpawensis* Wickenden (1932a), from which it differs in the chambers being more inflated, the sutures more depressed, its cross section less circular, and its test shorter and less slender.

Order RADIOLARIA

Genus DICTYOMITRA Ehrenberg
DICTYOMITRA MULTICOSTATA Zittel, 1876
Plate 48, figures 3, 8

This species occurs abundantly in the lower half of the Lea Park shale and the upper 50 feet or more of the Lloydminster shale, where it is invariably pyritized. It has been described by D. Rust (1892 p. 109) from the lower part of the Pierre in Manitoba. The following description is quoted from his article;

Shell slender conical with prominent longitudinal ribs, and from eight to ten deep strictures. Length and breadth of the joints gradually increasing, the eighth joint being twice as long and broad as the fourth joint. Pores regular circular, one series in each longitudinal furrow, three to four pores in each joint.

Length of the shell (with eight joints)	0.2 mm.
Length of the fourth joint	0.02 mm.
Length of the eighth joint	0.04 mm.
Breadth of the fourth joint	0.04 mm.
Breadth of the eighth joint	0.08 mm.

This species is likewise found in Secondary rocks of Germany (Chalk of Brunswick, &c.) Zittel.

Hypotype.—Stanford Univ. Pal. Type Coll., no. 7951.

Dimensions.—hypotype;

Length (with 9 joints)	0.25 mm.
Length of fourth joint	0.02 mm.
Length of eighth joint	0.04 mm.
Breadth of fourth joint	0.05 mm.
Breadth of eighth joint	0.09 mm.

Locality of hypotype.—Imperial Core Test No. 69, in Legal subdivision 4, sec. 23, T. 55, R. 4, W. 4th meridian from a depth of 420 feet.

Order OSTRACODA

Genus CYTHERIDEA Bosquet, 1852
CYTHERIDEA CANADENSIS H. W. Scott, n. sp.
Text figure 3

Carapace ovate, dorsum broadly convex, venter gently convex. Posterodorsal slope

FIG. 3—*Cytheridea canadensis* Scott, n. sp. Interior of left valve of holotype, length 0.93 mm.

straight, posteroventral slope convex; posterior end terminated at midline. Anterodorsal slope long, rounded similar to dorsal margin; anteroventral slope short and sharply rounded, greatest extension of anterior end below median line. Entire surface of carapace closely covered with deep irregularly arranged pits of moderate but slightly variable size. Left valve largest, overlaps right all around, minimum overlap on anterior end. Dorsal view elongate-ovate; greatest thickness in posterior third. Hinge in left valve consists of two shallow, elongate sockets separated by a narrow ridge; the lower of the elongate grooves is terminated at each end by large elliptical sockets bordered on their inner margins by five prominent crenulations. Marginal area fairly broad, bearing numerous close-set radial pore canals, about 50 across anterior end and about one-third as many on posterior end.

Length 0.70 mm.; height 0.46 mm.; thick-

ness 0.36 mm.; width of flange in anterior end 0.06 mm.; length of hinge between crenulated sockets 0.25 mm.

Types.—*Holotype*, Univ. of Ill. no. x-1800, paratype no. x-1801.

Remarks.—The specimens are from 24 feet below the top of the Grizzly Bear tongue at Stanford University locality M-300 in N.E. ¼ Sec. 30, T. 49, R. 6, W. 4th meridian where it is common and associated with *Haplophragmoides rota*. It also occurs sparingly in the Vanesti tongue and in the upper part of the Lea Park shale.

The description and figure of this new species have been furnished by Dr. H. W. Scott of the University of Illinois for inclusion in this report.

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JOURNAL OF PALEONTOLOGY, VOL. 21, NO. 4, PP. 344–345, JULY 1947

THE GENOTYPE OF ISOARCA (CLASS PELECYPODA)

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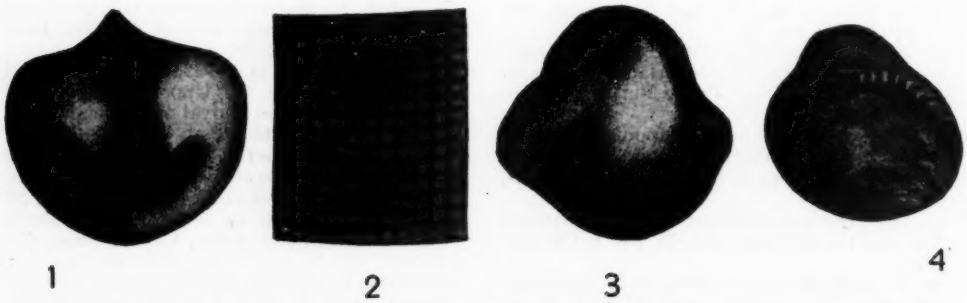
ABSTRACT—The genotype of the pelecypod *Isoarca* Münster, 1842, is *Isocardia subspirata* Münster, 1837, subsequently designated by Woodward, 1854.

MÜNSTER (1842, p. 98) proposed the generic name *Isoarca* for species of pelecypods which have an external form similar to *Isocardia* and a taxodont hinge similar to *Glycymeris*, *Limopsis*, or *Nucula*. Three species were cited in the original description of the genus: *Isocardia transversa* Münster, 1837; *Isocardia subspirata* Münster, 1837; and *Isocardia texata* Münster, 1837, all from Goldfuss (1837, pl. 140, figs. 9a-c). Since the hinge is not shown in this species, a figure of *Pectunculus texatus* Münster, 1837, is also presented (copied from Goldfuss, 1837, pl. 126, fig. 1b).

D'Orbigny (1850, vol. 1, p. 367) listed *Isoarca subspirata* from his Oxfordian Stage. Woodward (1854, p. 269) stated that this species came from the Oxford Clay of France



FIGS. *1–3*—*Isocardia subspirata* Münster, 1837, (Genotype of *Isoacra*); Figs. *1*, *3*—Internal casts, natural size; Fig. *2*—Enlarged to show surface ornamentation. Fig. *4*—*Pectunculus texatus* Münster, 1837, view showing hinge structure. (Figs. *1–3*—Copied from Goldfuss, 1837, pl. 140, figs. *9a–c*; Fig. *4*—Copied from Goldfuss, 1837, pl. 126, fig. *1b*).

from the Upper Jurassic of Germany. They were described and figured by Münster in Goldfuss' Petrefacta Germaniae (1837, pp. 209, 210, pl. 140, figs. 8, 9, 11).

Isocardia subspirata was designated by Woodward (1854, p. 269) as the genotype of *Isoarca*. This designation of the type was overlooked by Stoliczka (1871, p. 339) and by Reinhart (1935, pp. 10, 11) both of whom cited *Isoarca decussata* Münster, 1843, as the genotype. *Isoarca decussata* was not among Münster's original list of species, but it may be a synonym of *Isocardia transversa* (see Quenstedt 1852, p. 527; 1858, p. 631).

The genotype of *Isoarca*, *Isocardia subspirata* Münster, 1837, is here refigured and Germany, and Quenstedt (1858, p. 631) mentioned *Isocardia subspirata* in the discussion on the fauna of his Gamma member of the White Jura. In the original description of the species Münster stated that it occurred near Heiligenstadt, which is about 50 kilometers north and a little east of Nürnberg, Germany. This locality appears to be on the margin of the White Jura of that area.

The exact systematic position of this peculiar genus is in doubt. Münster in his original description of *Isoarca* stated his belief that it is a member of the family Arcidae. Quenstedt (1858, p. 761) considered *Isoarca* to be a subgenus of *Nucula*.

D'Orbigny (1851, p. 66) also regarded *Isoarca* as a relative of *Nucula*. Stoliczka (1871, pp. 338, 339) placed *Isoarca* with the Arcinae but admitted that the nacreous and solid shell made it more closely related to the *Nuculidae*. Arkell (1930, p. 350) compared *Carbonarca* Meek and Worthen from the Upper Carboniferous with *Isoarca* and noted that the genus has very little in common morphologically with the Arcidae, but, on the grounds of shell structure, it is more closely related to the Nuculidae.

Isoarca cannot be placed in the Arcidae because its ligamental area consists of only a thin external groove which extends from the beaks posteriorly, and because the nacreous shell is unlike that of the Arcidae. For the same reasons this genus does not belong to the Glycymeridae, although the teeth are arranged in an arc like members of this family. Schenck has shown (1934, p. 7, pl. 1, fig. 9) that *Isoarca* does not belong to the Nuculidae, and it lacks the chondrophore which is found in all nuculids. It lacks the triangular ligament pit of the Limopsidae. Its hinge and ligament most closely resemble similar structures in members of the Malletiidae, and in the shape of its shell it is most like *Tindaria* of that family. The Malletiidae, however, do not have a nacreous shell. Perhaps *Isoarca* will have to be allocated to a separate family.

The genus ranges from the Middle Jurassic (Bajocian Stage) to Upper Cretaceous (Senonian Stage) according to D'Orbigny, 1850.

The writer wishes to express his gratitude to Dr. Myra Keen and Dr. Siemon Muller of Stanford University and Dr. Leo G. Hertlein of the California Academy of Sciences for pointing out papers relevant to this subject.

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JOURNAL OF PALEONTOLOGY, VOL. 21, NO. 4, PP. 346–350, PL. 50, JULY 1947

TROPICAL AMERICAN SPECIES OF *GLYCYMERIS* FROM THE TERTIARY OF CALIFORNIA, AND A NEW SPECIES FROM PANAMA

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ABSTRACT—*Glycymeris whaleyi* Nicol n. sp. and *G. branneri* Arnold, are described and figured. Both are from upper Oligocene and lower Miocene strata of California and are related to Tertiary and Quaternary species of the genus from the Panamic and Caribbean marine provinces. *Glycymeris schencki* Nicol, n. sp., a split-ribbed glycymerid from the Gatun Niocene of Panama, is described and figured.

INTRODUCTION AND ACKNOWLEDGEMENTS

THE tropical nature of the marine faunas found in upper Oligocene and lower Miocene strata of California has been noted by several paleontologists so it is not surprising to find two species of *Glycymeris* from these strata which have their nearest relatives in the Tertiary and Quaternary of the Panamic and Caribbean marine provinces. One California species is new; the other has been inadequately described and figured. Both are distinctive morphologically and may prove to be good stratigraphic markers.

A second new species of *Glycymeris*, *G. schencki*, is an addition to my earlier study (1945b) of the split-ribbed species of the genus, which are so characteristic of the Oligocene and Miocene of the Caribbean region.

In the study of the species from California I received valuable data and the loan of specimens from Dr. Leo G. Hertlein of the California Academy of Sciences, Mr. Harry Whaley and Dr. G. D. Hanna of the Tide Water Associated Oil Company, Mrs. P. Rossello Nicholson of the University of California, and Dr. L. W. Stephenson of the U. S. National Museum.

Mr. T. F. Thompson collected the specimens and obtained locality and stratigraphic data used in the portion of this paper concerned with the Panama species. This information is published with the permission of the Acting Governor of the Panama Canal Zone.

I gratefully acknowledge the aid of Dr. A. Myra Keen of Stanford University who made many valuable suggestions concerning the Tertiary stratigraphy of California and also helped in the preparation of the manuscript.

SYSTEMATIC DESCRIPTIONS

Family GLYCYMERIDAE Stewart, 1930
Genus GLYCYMERIS Da Costa, 1778
Genotype ARCA GLYCYMERIS Linné, 1758
GLYCYMERIS, *sensu stricto*

GLYCYMERIS BRANNERI Arnold, 1908

Plate 50, figures 12–15

Glycymeris branneri Arnold, 1908, U. S. Nat. Mus. Proc., vol. 34, pp. 377, 378, pl. 34, fig. 1.
Glycymeris branneri, Branner, Newsom, and Arnold, 1909, US.G.S. Folio 163, fig. 35.
Glycymeris branneri, Clark, 1929, Stratigraphy and faunal horizons of the Coast Ranges of California, pl. 19, fig. 2.
Glycymeris branneri, Loel and Corey, Univ. Calif. Pub., Bull. Dept. Geol. Sci., vol. 22, no. 3, p. 182, pl. 7, fig. 5 a, b.

Description.—Arnold's original description is as follows:

Shell averaging nearly 70 mm. in length, about as wide as long, suborbicular, equivalve, bilaterally unsymmetrical, considerably convex for one of this genus, thick and heavy; umbo somewhat anterior to center, protruding beyond hinge line and turned slightly toward the front; anterior dorsal margin straight, sloping steeply from umbo; anterior extremity quite sharply rounded, and located above center line of shell; posterior dorsal margin straight, sloping less steeply than anterior; posterior extremity protruding obliquely downward and backward, regularly rounded, located below center line of shell; posterior dorsal and ventral margins join in a faintly defined angle considerably above and in front of the extreme end of the shell. Surface sculptured by numerous flat to concave-topped, close-set, radiating ribs (about 55 discernible in the type), relatively much broader toward the middle of the shell and becoming narrower and less well defined toward

either end; in the later stages of growth a raised beaded intercalary line occupies the interspace and (in the type) rises above the level of the ribs; prominent incremental lamellae cross the ribs, bowing convexly upward toward the umbo; they are straight on the sides and across the top of the ribs, and become less prominent and more closely set toward the periphery in the adult shell. Hinge with 5 or 6 boomerang-shaped teeth, with angle toward the umbo, on either isde of a centrally divaricately striated broad ligamental area; the teeth in the young form a semicircle below and extending on either side beyond the ligamental area, but in the later stages of growth the centrally situated teeth are obliterated by encroachment of the ligament. Interior unknown, but interior of margins appear to be smooth.

To this description the following observations are added: Arnold's specimen was eroded so that he did not have a correct impression of some of the features of the shell, especially the ornamentation. The radial ribs are flat and are separated by lines or grooves. Secondary superimposed radial ribs do occur but are weakly developed and are only seen in certain areas of the shell. On some specimens collected by Whaley and Hanna the shell is so eroded that the primary radial ribs are faintly marked, but the superimposed secondary radials are much more prominent. No concentric ornamentation is present.

The shell of one of the hypotypes at the California Academy of Sciences is 8 millimeters thick.

The asymmetrical outline of the shell is shown in plate 50, figure 15.

The interior ventral border is crenulated. The crenulations are long and slender with pointed ends and sunken centers.

Contrary to Arnold's observation, the specimens seen by the writer usually have orthogyrate beaks; occasionally the beaks are slightly opisthogyrate.

The ligamental area is large, and on well-preserved specimens the ligamental chevrons number from 6 to 9, are large, and are strongly marked.

Comparisons.—The only closely related fossil species is *Glycymeris swartsi* Hertlein and Jordon from lower Miocene beds of Lower California. *G. branneri* is a larger species, the crenulations on the inner ventral border are larger and have sunken centers, and the hinge teeth are larger and fewer in number than in *G. swartsi*.

Glycymeris gigantea (Reeve), a Recent species living in the Gulf of California, is a close analogue to *G. branneri*, but the former is larger and has more prominent superimposed secondary ribs. The two species resemble each other in shell outline, ligamental area, and crenulations on the inner ventral border.

Type specimens.—Holotype No. 165455 U. S. National Museum; plastoholotype No. 7876 Stanford Univ. Paleontology Type Collection; hypotype No. 31833 Univ. California Collection Invertebrate Paleontology (Berkeley); three hypotypes deposited in California Academy of Sciences Type Collection.

Type locality.—Locality No. 12 of Arnold, 1908; Mindego Creek, ¾ mile northwest of Mindego Hill and 1 mile above its confluence with Alpine Creek, Santa Cruz Quadrangle, San Mateo County, California.

Locality data.—Two hypotypes of *Glycymeris branneri* were collected by the late Dr. F. M. Anderson (California Academy of Sciences loc. 69) on the south and west slopes of Pyramid Hill, 4 to 5 miles due north of the Power Plant in Kern River and about 15 miles northeast of Bakersfield, Kern County, California. Specimens were also collected by Whaley and Hanna at the type locality of *G. whaleyi*.

Stratigraphic data.—*Glycymeris branneri* is found in upper Oligocene and lower Miocene strata of California.

GLYCYMERIS, *sensu lato*
GLYCYMERIS WHALEYI Nicol, n. sp.
Plate 50, figures 7–11

Description.—Shell of medium size and thickness, outline of valves subcircular, with posterior side slightly produced; ratio of convexity to height 0.70; beaks orthogyrate and median in position; ligamental area amphidetic, short and high, with 6 to 8 delicate, distinct, chevron-shaped grooves; hinge teeth about 20 in number, central teeth may be absent on large specimens; hinge plate strongly arched; denticulations on inner ventral border large, few in number with sunken centers and blunt ends.

The radial ribbing of this species varies with the size of the shell. On small specimens, or on the umbonal region and at

either end of the shell, the radial ribs are raised, with well-rounded crests, separated by narrower interspaces. Toward the ventral margin on larger specimens these ribs become much wider and flatter and are secondarily grooved so that each rib may be divided into three parts. The interspaces remain linear. The number of radial ribs varies from 18 to 25, not including the secondary splitting of the ribs. No concentric ornamentation is present.

	Height	*Length*	*Convexity (one valve)*
Holotype	37.2 mm.	39.2 mm.	13.2 mm.
Paratype	48.4 mm.	47.4 mm.	
Paratype	41.3 mm.	41.8 mm.	
Paratype	40.5 mm.	42.8 mm.	

Remarks.—This species is named for Mr. Harry Whaley, geologist with the Tide Water Associated Oil Company, who collected specimens at the type locality.

Comparisons.—The nearest related fossil species are all found in rocks of Miocene age in Columbia and Venezuela. *Glycymeris whaleyi* resembles *G. lloydsmithi* Pilsbry and Brown from the Miocene of Colombia but differs from the latter by having the chevron-shaped ligamental grooves present and by having flatter and more distinctly split radial ribs. *G. democraciana* F. and H. Hodson from the Miocene of Venezuela differs from the California species by having a higher arched hinge plate and by being more produced posteriorly. *G. whaleyi* differs from *G. usiacurii* Anderson from the Miocene of Columbia in lacking secondary intercalated ribs in the interspaces. The remainder of the split-ribbed species described from rocks of Miocene age in the Caribbean region generally have stronger ribs than *G. whaleyi*.

The closest related living analogue to *Glycymeris whaleyi* is *G. bicolor* (Reeve) from the Gulf of California. *G. bicolor* has more numerous, narrower, and more prominent ribs; also more numerous and smaller denticulations on the inner ventral border of the shell.

Type specimens.—The holotype and nine paratypes are deposited in the California Academy of Sciences Type Collection and three paratypes, nos. 7877-7879, in the Stanford University Paleontology Type Collection. One paratype has been sent to the U. S. National Museum and one to the University of California (Berkeley).

Type locality.—North, 71° west 5,800 feet from intersection of 119° 45′ meridian and 35° 00′ parallel as shown on War Department map of Caliente Mountain Quadrangle, Caliente Mountain Range, San Luis Obispo County, California.

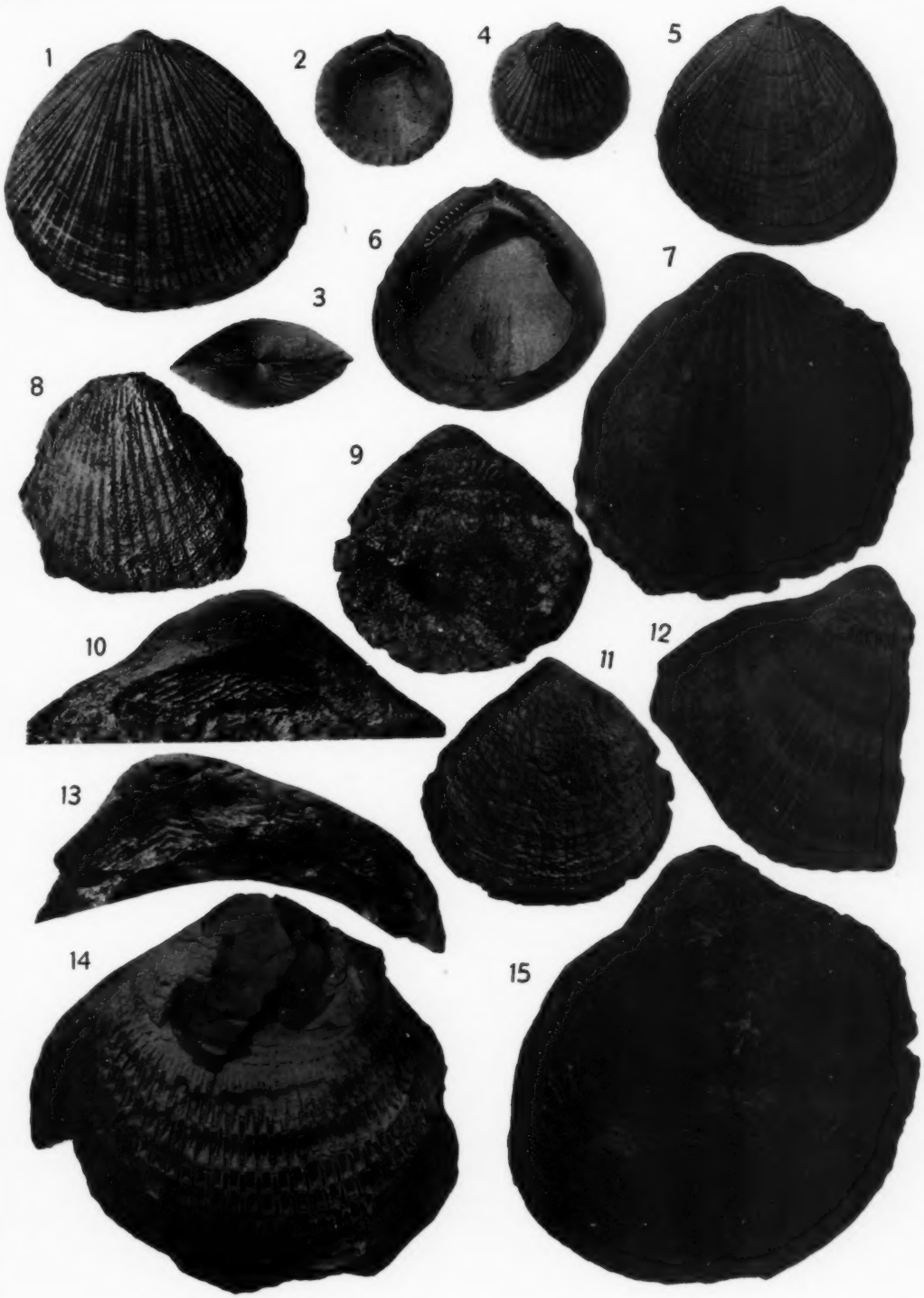
Locality data.—In addition to those from the type locality, four specimens of *Glycymeris whaleyi* were collected by Mr. Donald C. Birch 2,000 feet north and 400 feet west of the southeast corner of sec. 36, T. 16 S., R. 13 E.; approximately 800 feet south of the point where the first Temblor "reef"

EXPLANATION OF PLATE 50

FIGS. *1–6*—*Glycymeris schencki* Nicol, n. sp. *1*, Exterior view, left valve, paratype 7888 in Stanford Paleontological Type Collection. All specimens figured are from L.S.J.U. locality 2654 (the type locality of the species), and are here shown at a scale of ×1.5 natural size. *2*, Interior view, right valve, paratype 7886; *3*, dorsal view, both valves, paratype 7883; *4*, exterior view, right valve, paratype 7886; *5*, exterior view, left valve, holotype 7880; *6*, Interior view, left valve, holotype 7880. (p. 349)

7–11—*Glycymeris whaleyi* Nicol, n. sp. All specimens illustrated are in the California Academy of Sciences Type Collection, and figures are natural size unless otherwise indicated. *7*, Paratype, right valve, Fresno County, California, no. 7877 Stanford University Paleontological Type Collection; *8*, paratype, exterior showing ribbing; *9*, holotype, right valve interior; *10*, same specimen as no. *7*, ligamental area, ×2; *11*, holotype, right valve exterior. Numbers *8*, *9*, and *11* are from San Luis Obispo County, California. (p. 347)

12–15—*Glycymeris branneri* Arnold. *12*, Hypotype, exterior showing ribbing; *13*, hypotype, showing ligamental area; *14*, same as specimen as no. *13*, showing exterior; *15*, hypotype, right valve, exterior. Numbers *12–14* from Kern County, California, no. *15* from San Luis Obispo County, California. All specimens in the California Academy of Sciences Type Collection. All figures natural size. (p. 346)



Nicol – Tertiary *Glycymeris*

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crosses Arroyo Ciervo, Fresno County, California.

Stratigraphic data.—At both localities the fossils were embedded in coarse-grained calcareous sandstone. Fossils associated with *Glycymeris whaleyi* at the type locality are *Pecten* (*Lyropecten*) *miguelensis* Arnold and *Pecten* (*Lyropecten*) *bowersi* Arnold, and at the Fresno County locality are *Turritella ocoyana* Conrad and *Pecten* (*Aequipecten*) *andersoni* Arnold. The species of *Pecten* and *Turritella* indicate upper Oligocene or lower Miocene age (Zemorrian, Saucesian, and Relizian stages).

GLYCYMERIS SCHENCKI Nicol, n. sp.
Plate 50, figures 1-6

Description.—Shell thin; valves subcircular in small specimens, trigonal-ovate with posterior side slightly produced in large specimens; dorsal margin short and straight, ventral margin rounded; length and height equal in small specimens, length slightly greater than height in large specimens; convexity slight for a glycymerid, ratio of convexity to height about 0.55; ligamental area amphidetic, small and low; ligamental chevrons distinctly marked, delicate, from four to six in number; teeth small, subequal, numerous, 23 to 32 average 27, showing faint striations on their sides, center teeth not aborted by ligamental area in large specimens; beaks orthogyrate, contiguous; umbones flat; interior of shell bearing faint radial striations; pallial line continuous, showing slightly larger sinus below posterior than below anterior adductor muscle scar; posterior scar more nearly circular in outline than anterior; both scars bordered at their inner sides by raised areas which converge toward beaks; all well-preserved specimens show fine, closely spaced, concentric striae, especially prominent on radial ribs; radial ribs delicate, rounded, on umbonal region not split and no secondary ribs occur in narrow interspaces; with increasing size primary radial ribs split, secondary ribs form in interspaces; radial ribs on anterior and posterior ends of shell small, often not split, with numerous small ribs in interspaces; number of crenulations on inner ventral margin likewise increase with increasing size reflecting change in ornamentation; smallest specimens have crenulations with bifid ends and sunken centers, small raised nodes present in interspaces; on largest specimens nodes take on appearance of crenulations and crenulations acquire split appearance.

The Table records height in millimeters, number of ribs, number of teeth, and number of crenulations on the inner ventral border of each specimen. Even the smallest specimen examined has split primary radial ribs with secondary ribs occurring in the interspaces.

Specimen	*Height in millimeters*	*Number of ribs*	*Number of teeth*	*Number of crenulations*
Paratype 7886	13.4	61	24	15
Paratype Univ. of Calif.	14.1	65	24	12
Paratype 7885	15.0	67	23	15
Paratype 7884	17.0	60	26	14
Paratype 7882	17.7	62	22	14
Paratype Pal. Res. Inst.	17.8	67	23	13
Paratype U. S. Nat. Mus.	21.0	77	25	15
Paratype 7887	21.5	79	31	15
Holotype 7880	23.0	85	32	21
Paratype 7888	27.3	91	25	21

Remarks.—This species is named for Dr. Hubert G. Schenck of Stanford University who made some preliminary studies on the Glycymeridae and has encouraged me to continue this research.

Comparisons.—*Glycymeris secticostata* Nicol from the Gatun formation of Costa Rica is most closely related to *G. schencki*. The latter, however, has more numerous and smaller ribs, a slightly smaller and thinner shell, the large specimens are subtrigonal and produced posteriorly, and the crenulations on the inner ventral margin have bifid ends.

Glycymeris schencki differs from *G. trilobicosta* Pilsbry and Brown from Columbia by having more than twice as many ribs

none of which are brace-shaped.

Glycymeris lamyi Dall from the Tampa limestone of Florida has only secondary intercalated ribs; the primary radial ribs are not split. The shell also is not as produced posteriorly as in *G. schencki.*

Glycymeris lamyi tampae Mansfield from the Tampa limestone of Florida has a rounded outline, and the crenulations on the inner ventral border are not bifid as they are in *G. schencki.*

The *Glycymeris trilobicosta* of Maury from the Miocene of Trinidad has fewer and less divided ribs than *G. schencki.*

Split-ribbed species of *Glycymeris* from Venezuela and Colombia all have much coarser ribs than *G. schencki.*

Type specimens.—Holotype No. 7880 and paratypes, Nos. 7881-7888 inclusive, Stanford University Paleontology Type Collection. Unfigured paratypes are deposited in the following collections: U. S. National Museum, California Academy of Sciences, University of California (Berkeley), Paleontological Research Institution (Ithaca, New York).

Type locality.—L.S.J.U. loc. 2654; North Latitude 9° 18′, West Longitude 79° 55′ +200 feet, Panama Canal Zone; Gatun formation, Miocene.

Locality and stratigraphic data.—In addition to those from the type locality of this species, one specimen each was found at the following localities: L.S.J.U. loc. 2653, North Latitude 9° 16′+4,700 feet, West Longitude 79° 54′+5,800 feet, Panama Canal Zone; L.S.J.U. loc. 2656, North Latitude 9° 21′+5,000 feet, West Longitude 79° 50′+1,000 feet, Colon Province, Panama.

Fourteen of the fifteen specimens of *Glycymeris schencki* were found within a zone about 150 feet thick as locality 2654 is-about 150 feet higher in the Gatun formation than locality 2653. Locality 2656 is stratigraphically much lower than either of the others and the specimen from it may differ subspecifically from the others because some of the radial ribs on the central part of the shell are not split.

Although exact stratigraphic data have as yet not been recorded, the age of that part of the Gatun formation containing these glycymerids appears to be Miocene.

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JOURNAL OF PALEONTOLOGY, VOL. 21, NO. 4, PP. 351–354, PL. 51, JULY 1947

A KONINCKIOCERAS FROM THE LOWER PERMIAN OF NORTH-CENTRAL TEXAS

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ABSTRACT—Hyatt's genus *Koninckioceras* is discussed at some length, and *K. bibbi*, n. sp., is described from near the base of the Lueders formation in Baylor County, Texas. This species is the only valid representative of the genus known from the Permian.

IT IS generally believed that in the Permian nautiloids are not as abundant as are ammonoids but at some localities the reverse is true. Furthermore, the relative dearth of Permian nautiloids is almost certainly more apparent than real for they are often regarded as of comparatively little stratigraphic value and therefore have not received the consideration that has been accorded the ammonoids. As a result only about a score of nautiloid genera are known to occur in the Permian, and therefore the discovery of a representative of an additional genus seems to merit special consideration.

The specimen to which we refer is in our opinion the first valid representative of Hyatt's genus *Koninckioceras* to be reported from the Permian. It was found some time ago by Mr. Flynt Bibb of Seymour, Texas, at the so-called "Alligator hole" in Miller Creek about 12 miles southeast of Seymour, Baylor County, Texas. It is preserved in light gray buff-weathering fine-grained limestone and presumably came from near the base of the Lueders formation.

When Hyatt established the genus *Koninckioceras* in 1883 he stated: "Type, Kon. (Naut.) ingens sp. De Kon. Calc. Carbon. pl. 23, Mus. Comp. Zool. Camb.," meaning that he was basing the genus on the specimen from the Mississippian of Belgium which de Koninck had figured on his plate 23 of 1878 as *Nautilus ingens* Martin and which had been deposited in the Harvard Museum of Comparative Zoology. According to Foord (1891, pp. 176–178) this specimen is not conspecific with the type of *Conchyliolithus Nautilites* [*Nautilus*] *ingens* Martin which came from England. Presumably therefore the genoholotype of *Koninckioceras* is without a valid specific name, and we propose to call it **K. koninckı.** It is an internal mold of a phragmacone which is about 13½ cm. in diameter and which consists of about two and a half volutions in which the conch attains a maximum height and width of about 4 cm. and 6 cm., respectively.

Hyatt (1893 p. 439) stated that de Koninck's figures of this specimen are not accurate in certain details. Nevertheless, it is clear from them that the genoholotype has a large subdiscoidal tarphyceraconic conch in which the volutions are depressed and elliptical in cross section (except for the slight dorsal impression), that the umbilicus is very large and perforate, that the sutures are essentially straight and directly transverse, and that the siphuncle is small and subcentral in position. When Hyatt (1893, p. 440) compared this genus with *Domatoceras*, he stressed the fact that at maturity the ventral and lateral zones of the conch become flattened in that genus but remain rounded in *Koninckioceras* throughout ontogenetic development.

Hyatt regarded *Koninckioceras* as being exclusively Carboniferous but some ten years ago Newell (1936, p. 486) referred to it *Domatoceras militarium* Hyatt and *D. simplex* Hyatt from the Lower Permian Clyde formation of north-central Texas. As was noted by Hyatt (1893, p. 441), the generic affinities of these two species are uncertain. Their whorls are flattened laterally and ventrally and their lateral zones converge ventrad, as in typical *Domatoceras;* but the conch is depressed as in *Metacoceras*, rather than compressed as in *Domatoceras*. In our opinion these species are not very

close to the genotype of *Koninckioceras*, and they should not be referred to that genus.

Nautilus subcariniferus Tzwetaev of the lower Pennsylvanian of European Russia, which Hyatt (1893, p. 439) referred to *Koninckioceras* has been assigned to *Knighticeras* by Miller and Owen (1934, p. 219). Also, we are inclined to eliminate from *Koninckioceras* the three forms from the middle Pennsylvanian of Kansas that Newell (1936, pp. 485–488, pls, 71, 72) described as *K. eliasi*, *K. jewetti*, and *K. wyandottense*—in all of them the conch is more or less flattened rather than rounded ventrally and the external sutures form broad rounded ventral lobes, rather than being essentially straight. However, we regard *Temnocheilus scottense* Worthen (1890, p. 151, pl. 27, figs. 3, 3a) from the Mississippian (Warsaw) of Illinois as a valid representative of *Koninckioceras*, and the paleontological collections of The University of Kansas contain a specimen from the Pennsylvanian Kansas City group at Westport, Missouri, that appears to be congeneric. *Nautilus implicatus* de Koninck (1878, p. 103, pl. 13, figs. 2, 3) of the Tournaician (Kinderhook quivalent) of Belgium, which was referred to *Koninckioceras* by Hyatt, has a sharp dorsolateral angle or keel but otherwise appears to possess the characters of the genus, and for the present, at least, it is probably best to retain it with *K. koninckı*.

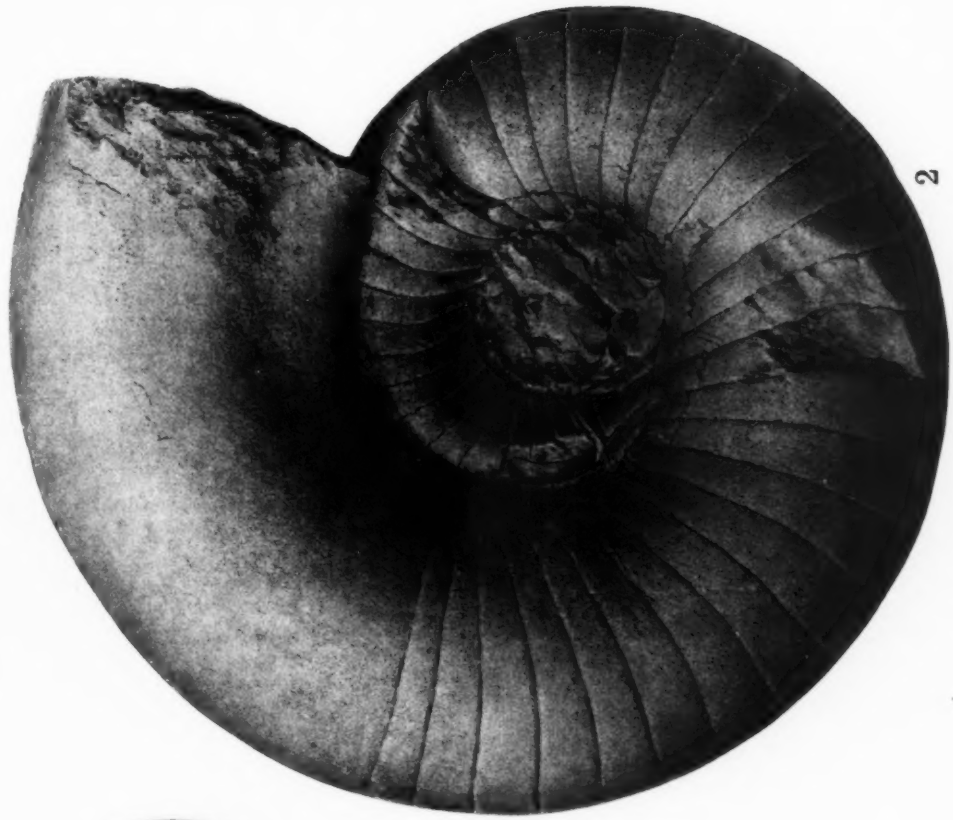
For some time the junior author of this report has been collecting nautiloids from the Lower Permian of Baylor County, Texas, and she has secured representatives of the following genera from the Elm Creek limestone of the Admiral formation, near the middle of the Lower Permian: *Domatoceras?*, *Liroceras*, *Metacoceras*, *Mooreoceras*, *Pseudorthoceras*, *Stenopoceras*, and *Temnocheilus*. Some 500 feet higher in the section, in the Grape Creek limestone of the Clyde formation (the horizon of the well-known "Old Military Crossing" of the Big Wichita River), specimens have been collected that belong in *Domatoceras?*, *Endolobus*, *Liroceras*, *Metacoceras*, *Mooreoceras*, *Pseudorthoceras*, *Stenopoceras*, *Tainoceras*, and *Temnocheilus*. In the Lueders formation (and possibly just below its base), about 100 feet stratigraphically above the Grape Creek, the following genera of nautiloids have been found: *Endolobus?*, *Koninckioceras*, *Metacoceras*, *Mooreoceras*, *Solenochilus*, *Stenopoceras*, *Tainoceras*, and *Temnocheilus*.

In 1933 Miller, Dunbar, and Condra (pp. 145–146) pointed out that specimens from the Clyde formation at the "Old Military Crossing" which Hyatt (1893, pp. 402–404, text figs. 5–7) referred to *Tainoceras* [*Nautilus*] *quadrangulum* (McChesney) are not conspecific with the figured type of that species, which came from a much lower zone and they are without a valid specific name. In 1891, White (p. 23, pl. 2, figs. 11, 12) illustrated as *Nautilus occidentalis* Swallow a specimen from the "Old Military Crossing" that is almost certainly conspecific with those from this locality which Hyatt studied but it does not seem to be referable to Swallow's species, the type specimens of which were never illustrated and presumably were lost in the fire at the University of Missouri in 1892. The collections of the junior author of the present report contain a number of specimens of *Tainoceras* from the Clyde. These show a certain amount of variation in the nodes but are, in our opinion, conspecific with the specimens illustrated by Hyatt and White from the same formation. In order to clarify the situation and to carry Miller, Dunbar, and Condra's observations to a logical conclusion, we here propose the name **Tainoceras clydense,** n. sp., for the Clyde specimens under consideration. They probably resemble *T. nodicarinatum* (McChesney) from the Pennsylvanian of Illinois more closely than any other known species, but are differentiated by a relatively wider conch.

Acknowledgement is due to the Graduate College of The State University of Iowa for making the preparation of this report financially possible, to Mr. Howard Webster of Iowa City for retouching the accompanying photographs, and especially to Mr.

EXPLANATION OF PLATE 51

FIGS. *1, 2—Koninckioceras bibbi*, Miller and Kemp, n. sp. Ventral and lateral views of holotype, from near base of Lueders formation about 12 miles southwest of Seymour, Texas. ×¾.



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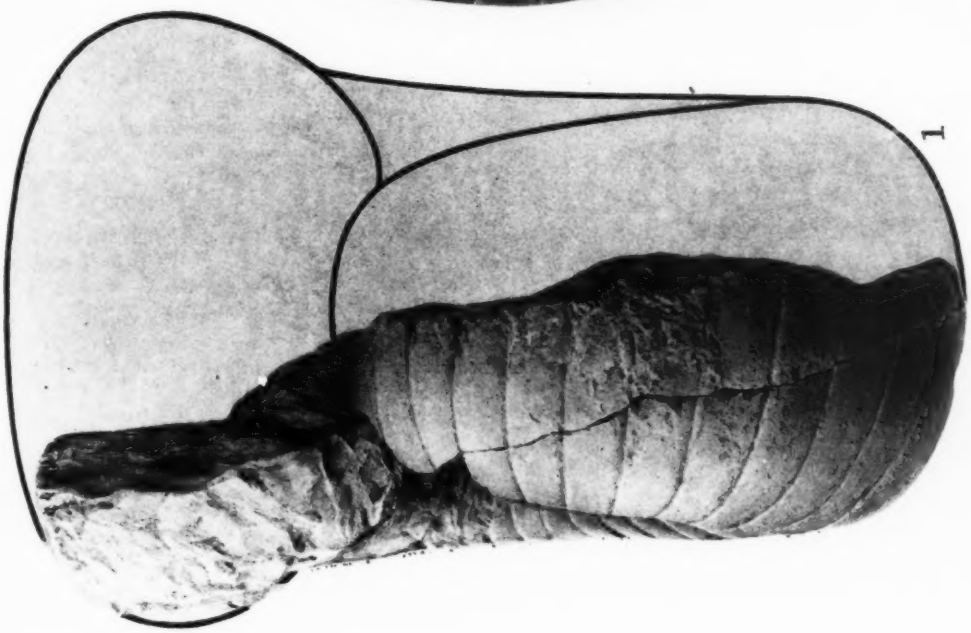

1

Miller and Kemp – Permian Cephalopod

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Flynt Bibb of Seymour, Texas, for donating the specimen on which this study is based.

KONINCKIOCERAS BIBBI, n. sp.
Plate 51, figures 1, 2

The unique specimen on which this species is based is a well preserved internal mold. It represents almost all of the left side of the conch and a small part of the right side of the adapical volution. It is large, attaining a maximum diameter of approximately 250 mm., although it is not complete adorally. In shape it is thickly subdiscoidal, and in mode of growth tarphyceraconic.

The conch expands orad rapidly. The holotype consists of less than two full volutions—its adapical portion is not well preserved and is of rather indefinite extent. The incomplete living chamber of this specimen is about a quarter of a volution in length. The whorls are subelliptical in cross section, being wider than high, very broadly rounded ventrally, rounded ventrolaterally, laterally, and dorsolaterally, and moderately impressed dorsally. Near the mid-length of the first volution, the conch is about 30 mm. wide and about 35 mm. high, but these measurements may not be very significant inasmuch as this portion of the specimen appears to have been distorted during preservation.

Both the umbilicus and the umbilical perforation are large. The umbilical shoulders are rounded and indefinite, but the maximum diameter of the area outlined by the umbilical seam measures about 97 mm.

No trace of surface ornamentation of the test is discernible on the specimen.

The camerae are numerous and comparatively short—there are 35 of them in the adoral volution. The length of the camerae increases gradually up to the adoral quarter volution and then decreases, suggesting that the specimen represents a fully mature, or possibly senile, individual. The external sutures are essentially straight and directly transverse, but on the umbilical walls they swing distinctly orad toward the dorsum. No trace of the siphuncle is retained but clearly it was not ventral (marginal) in position.

Remarks.—This species, although in general similar to the genotype, has a larger, more rapidly expanded, and more robust conch, which consists of fewer volutions. In the genotype the umbilical portions of the sutures do not swing orad toward the umbilical seams as they do in our species. The only known representative of *K. scottense* (Worthen) is relatively small, its whorls are almost as high as wide, and it has slightly but distinctly sinuous sutures which form ventral and lateral lobes; nevertheless, in general physiognomy it bears a striking resemblance to *K. bibbi*. The undescribed congeneric specimen from the Pennsylvanian of Missouri, mentioned above, is very incomplete and therefore detailed comparisons are not possible; it represents the left side of an outer half-volution of a mature conch, about 80 mm. in diameter, with whorls that are essentially elliptical in cross section and with sutures that appear to be straight and directly transverse.

Occurrence.—In or just below the basal portion of the Lueders formation at the so-called "Alligator hole" in Miller Creek about 12 miles southeast of Seymour, Baylor County, Texas.

Repository.—Private collection of Augusta Hasslock Kemp of Seymour, Texas.

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INDEX TO NEW GENERA, SPECIES, AND VARIETIES OF FORAMINIFERA FOR THE YEAR 1945 WITH SUPPLEMENTS FOR THE PERIOD 1939-1944, AND ADDENDA (1942–1945),

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THE FOLLOWING Index to new genera, species, and varieties (sub-species) of Foraminifera for the year 1945, with supplements for the six preceding years, lists the following new units: 7 superfamilies, 5 families, 4 subfamilies, 54 genera, 5 subgenera, 653 species, 168 varieties (subspecies), 26 *nomina nova*, 14 *nomina nuda*, 38 homonyms, and 239 forms to which the *nomenclatura aperta* was applied.

The corresponding bibliography, containing the full titles of the publications in which these new units were recorded, appeared in this journal, vol. 20, No. 6, November 1946, pp. 591–619.

For the year 1945 alone the following new units came to the attention of the compiler: 7 superfamilies, 4 families, 3 subfamilies, 21 genera, 3 subgenera, 293 species, 70 varieties (subspecies), 5 *nomina nova*, 7 *nomina nuda*, 6 homonyms (of which 2 were subsequently renamed) and 125 forms with *nomenclatura aperta*.

To the Index for the year 1939, published in this journal, vol. 16, No. 4, July 1942, pp. 504–517, should be added 2 new genera and 6 new species. This brings, so far, the total of new Foraminifera for the year 1939 to 32 genera, 3 subgenera, 529 species, 72 varieties, 4 *nomina nova*, 1 *nomen nudum*, 18 homonyms, and 65 forms with *nomenclatura aperta*.

The Index for the year 1940, published in this journal, vol. 17, No. 4, July 1943, pp. 398–407, is supplemented by 2 new genera, 9 new species, 1 new variety, 1 *nomen novum*, 1 *nomen nudum*, and 1 form with *nomenclatura aperta* bringing the total for the year 1940, up to this date, to 4 families, 1 subfamily, 17 genera, 11 subgenera, 390 species, 52 varieties, 8 *nomina nova*, 12 *nomina nuda*, 23 homonyms, and 62 forms with *nomenclatura aperta*.

The Index for the year 1941, published in this journal, vol. 18, No. 4, July 1944, pp. 394–404 is increased with 1 new family, 1 subfamily, 19 genera, 173 species, 62 varieties, 10 *nomina nova*, 3 *nomina nuda*, 22 homonyms, and 34 forms with *nomenclatura aperta*. This gives a total of new forms for the year 1941 of 2 families, 2 subfamilies, 39 genera, 474 species, 107 varieties, 13 *nomina nova*, 3 *nomina nuda*, 44 homonyms, and 129 forms with open nomenclature.

To the Index for the year 1942, published in this journal, vol. 19, No. 4, July 1945, pp. 403–409, are added as new 4 genera, 1 subgenus, 83 species, 16 varieties, 6 *nomina nova*, 6 homonyms, and 44 forms with *nomenclatura aperta*. So far the total of new Foraminifera for the year 1942 is, as follows: 3 families, 2 subfamilies, 20 genera, 5 subgenera, 250 species, 41 varieties, 7 *nomina nova*, 5 *nomina nuda*, 17 homonyms and 116 forms with *nomenclatura aperta*.

For the year 1943 the Index, published in this journal, vol. 19, No. 6, November 1945, pp. 651–655, is increased by 2 new genera, 33 species, 15 varieties, 3 *nomina nuda*, 2 homonyms, and 27 forms with *nomenclatura aperta*. This brings the total of new forms for 1943 up to 7 genera, 166 species, 31 varieties, 2 *nomina nova*, 4 homonyms, 3 *nomina nuda*, and 78 forms with *nomenclatura aperta*.

The Index for the year 1944, published in this journal, vol. 20, No. 2, March 1946, pp. 175–183, becomes larger with the addition of 4 new genera, 1 subgenus, 56 species, 4 varieties, 4 *nomina nova*, 2 homonyms, and 8 forms with *nomenclatura aperta* making a total for that year of 14 genera, 1 subgenus, 234 species, 34 varieties, 10 *nomina nova*, 15 *nomina nuda*, 8 homonyms, and 97 forms with *nomenclatura aperta*.

Full reference is made to the homonyms, cited in the following Index and Supple-

ments, in a short paper entitled "Additional Homonyms in Foraminifera erected since 1940," published in "Contributions from the Cushman Laboratory for Foraminiferal Research," vol. 22, part 4, December 1946, pp. 123–131.

For valuable information and help in compiling the present Index with its Supplements, cordial thanks are expressed to Dr. J. A. Cushman, Dr. H. G. Schenck, Dr. M. Reichel, Dr. R. F. Rutsch, Dr. A. ten Dam, Dr. T. Oinomikado, Miss R. Todd, Miss A. R. Messina, Mr. P. Marie, Mr. H. Benz, Mr. P. Soder, and to all those who kindly furnished reprints of their papers to the compiler. Miss Marianne Thalmann ably assisted in checking the manuscript.

The following statistical data regarding the new forms erected during the year 1945 may be of interest: Of the 21 new genera 4 are from Carboniferous, 6 from Permian, 4 from Eocene, and one each from Upper Cretaceous, Upper Cretaceous-Paleocene passage-beds, Paleocene, and Oligocene; one ranges from Upper Jurassic to Lower Tertiary, one from Eocene to Recent, and one from Oligocene to Miocene. Three of the new genera belong to the family Saccamminidae, 2 to the Nonionidae, and one each to the Ammodiscidae, Cymbaloporidae, Globigerinidae, Lagenidae, Miliolidae, Orbitolinidae, Peneroplidae, Uvigerinidae and Valvulinidae. In seven cases the authors did not state the respective family relationship. Two of the new genera, namely *Tricarinella* ten Dam and Schijfsma, and *Tschoppina* F. G. Keijzer are placed here in the synonymy of *Tristix* Macfadyen, 1941, and *Eodictyoconus* Cole and Bermudez, 1944, respectively.

The 368 new species, varieties, and *nomina nova* of the year 1945 are stratigraphically distributed, as follows: 35 from Carboniferous, 21 from Permian, 1 from Rhetian, 1 from Jurassic, 16 from Upper Cretaceous, 1 from Cretaceo-Paleocene, 12 from Paleocene, 75 from Eocene, 85 from Oligocene, 26 from Oligo-Miocene, 66 from Miocene, 3 from Plio-Pleistocene, and 26 Recent. In other words, the Paleozoic yielded about 16%, the Mesozoic 6%, the Tertiary 71% and the Holocene 7% of the new forms. Nothing was added to our knowledge of the Foraminifera of the Cambrian, Silurian, Devonian, Liassic, Lower Cretaceous, Pliocene proper, and Pleistocene proper during the year 1945.

INDEX TO NEW GENERA, SPECIES, AND VARIETIES (SUBSPECIES) OF FORAMINIFERA FOR THE YEAR 1945

Ammobaculites buiosensis Colom, Inst. Invest. "Lucas Mallada" Madrid, Estud. Geol. No. 2, p. 9, pl. 2, figs. 20–22. Miocene (Burdigalian), Mallorca, Spain.

Ammodiscus parvulus ten Dam, Geol. en Mijnbouw, vol. 7, p. 24, text figs. 1, 2. Upper Rhetian, Netherlands. For: *Ammodiscus incertus* Chapman, 1895 (non d'Orbigny, 1839), Ann. Mag. Nat. Hist., (6), vol. 16, p. 315, pl. 11, figs. 8, 9; and for: *Ammodiscus robertsoni* Chapman, 1895, (non Brady, 1876), *ibid.*, (6), vol. 16, p. 318, pl. 11, figs. 15–17.

Ammovertella retrorsa Cushman and Stainforth, Contr. Cushman Lab. Foram. Res., Spec. Publ. 14, p. 14, pl. 1, fig. 15. Middle Oligocene, Trinidad, B. W. I.

Amphistegina alabamensis Applin and Jordan, Jour. Paleontology, vol. 19, p. 145, pl. 21, fig. 3. Upper Eocene, Alabama.

——— *chipolensis* Cushman and Ponton, 1932 var. *grandis* Cushman and Ellisor, *ibid.*, vol. 19, p. 569, pl. 77, fig. 10. Middle Oligocene, Texas.

——— *lessonii* d'Orbigny, 1826, var. *bowdenensis* Palmer, Bull. Amer. Paleontology, vol. 29, No. 115, p. 64, pl. 2, fig. 1. Middle Miocene, Jamaica. For: *Amphistegina lessonii* Cushman, 1919 (non d'Orbigny, 1826), Carnegie Inst. Publ. No. 291, p. 50; and for: *? Amphistegina gibbosa* Cole, 1931, (non d'Orbigny, 1839), Florida State Geol. Surv., Bull. 6, p. 52, pl. 5, fig. 14.

——— ——— ——— var. *pulchra* Cushman and Todd, Cushman Lab. Foram Res., Spec. Publ. 15, p. 60, pl. 10, fig. 4. Miocene, Jamaica.

——— *nassauensis* Applin and Jordan, Jour. Paleontology, vol. 19, p. 145, pl. 21, fig. 2. Early Middle Eocene, Florida.

——— *pinarensis* Cushman and Bermudez, 1937, var. *cosdeni* Applin and Jordan, *ibid.*, p. 145, pl. 18, fig. 8. Upper Eocene, Florida, For: *Amphistegina pinarensis* Cushman and Bermudez, 1937, var. *lawsoni* Applin and Jordan, 1944 (error for var. *cosdeni* Applin and Applin), Bull. Amer. Assoc. Petrol. Geologists, vol. 28, p. 1685, pl. 2, figs. 2, 3.

——— *senni* Cushman, in Vaughan, Geol. Soc. America, Mem. 9, pt. 1. p. 49, pl. 19, figs. 1–4. Middle Eocene, Barbados.

Angulogerina jamaicensis Cushman and Todd, Cushman. Lab. Foram. Res., Spec. Publ. 15, p. 53, pl. 8, fig. 3. Miocene, Jamaica.

ANNULOFRONDICULARIA subgen. nov. F. G. Keijzer, Thesis, Univ. Utrecht, p. 196. New subgenus of *Frondicularia* Defrance, 1824. Family: not stated (Lagenidae); subgenotype: *Frondicularia annularis* d'Orbigny, 1846, Foram. Foss. Vienne, p. 59, pl. 2, figs. 44–47. Oligo-Miocene.

Annulopatellina advena Cushman and Stainforth, Cushman Lab. Foram. Res., Spec. Publ. 14, p. 59, pl. 10, fig. 16. Upper Oligocene, Trinidad, B. W. I.

Anomalina alazanensis Nuttall, 1932, var. *spissiformis* Cushman and Stainforth, *ibid.*, Spec. Publ. 14, p. 71, pl. 14, fig. 5. Upper Oligocene, Trinidad, B.W.I.

——— *bilateralis* Cushman, 1922, var. *anahuacana* Cushman and Ellisor, Jour. Paleontology, vol. 19, p. 571, pl. 78, fig. 6. Middle Oligocene, Texas.

——— *cosdeni* Applin and Jordan, *ibid.*, vol. 19, p. 147, pl. 19, fig. 10. Upper Cretaceous, Florida. For: *Anomalina rubiginosa* Cushman var. *cosdeni* Applin and Jordan, *nomen nudum*, Bull. Amer. Assoc. Petrol. Geologists, vol. 28, 1944, p. 1689, pl. 5, fig. 7.

——— *pseudogrosserugosa* Colom, Bol. R. Soc. Españ. Hist. Nat., vol. 43, p. 290, pl. 31, figs. 19–30. Miocene (Burdigalian), Mallorca, Spain.

Anomalinoides globosa Brotzen, Sverig. geol. Undersökn., Ser. C, No. 465, Arsbok 38, No. 7, p. 55, pl. 2, fig. 6. Cenomanian, Sweden.

ARCHAESPHAERA gen. nov. Suleimanov, Comptes Rendus (Doklady) Acad. Sci. U. R. S. S., vol. 48, p. 126. Family: Saccamminidae; genotype: *Archaesphaera minima* Suleimanov, 1945, *ut infra*. Lower Tournaisian and Etroeungt (Carboniferous).

——— *magna* Suleimanov, *ibid.*, vol. 48, p. 126, text fig. 2. Lower Tournaisian, U. R. S. S.

——— *minima* Suleimanov, *ibid.*, vol. 48, p. 126, text fig. 1. Lower Tournaisian, U. R. S. S.

Archaias columbiensis Applin and Jordan, Jour. Paleontology, vol. 19, p. 141, pl. 21, fig. 6. Early Middle Eocene, Florida.

Asterigerina lisbonensis Cushman and Todd, Contr. Cushman Lab. Foram, Res., vol. 21, p. 19, pl. 4, figs. 15–18. Eocene, Alabama.

———*subacuta* Cushman, 1922, var. *floridensis* Applin and Jordan, Jour. Paleontology, vol. 19. p. 144, Onomatype. Oligocene, Florida. (Note: This variety was figured by the authors as a *nomen nudum* 1944, in Bull. Amer. Assoc. Petrol. Geologists, vol. 28, p. 1688, pl. 1, fig. 3.).

Asterocyclina see *Discocyclina*.

ASTRORHIZIDEA superfam, nov. Glaessner, Principles of Micropaleontology, p. 88. Includes the families: Astrorhizidae, Saccamminidae, and Ammodiscidae.

Athecocyclina see *Pseudophragmina*.

Barbourinella bermudezi Palmer, Bull. Amer. Paleontology, vol. 29, No. 115, p. 23, pl. 1, fig. 1. Middle Miocene, Jamaica.

——— *nipeensis* F. G. Keijzer, Thesis Univ. Utrecht, p. 189, pl. 1., fig. 9. Oligo-Miocene, Cuba.

Bermudezina elegans F. G. Keijzer, *ibid.*, p. 189, pl. 1, fig. 12. Lower Oligocene, Cuba. For: *Heterostomella sp.* Coryell and Embich, 1937, Jour. Paleontology, vol. 11, p. 294, pl. 41, fig. 10.

——— *jamaicensis* Cushman and Todd, Cushman Lab. Foram. Res., Spec. Publ. 15, p. 5, pl. 1. fig. 13. Miocene, Jamaica.

Bigenerina compressissima Colom, Inst. Invest. geol. "Lucas Mallada," Madrid, Estud. geol. Nr. 3, p. 130, pl. 4, figs. 37–42. Miocene (Vindobonian), Mallorca, Spain.

——— *perexigua* Plummer, Univ. Texas Publ. 4401, p. 243, pl. 16, figs. 19, 20. Lower Middle Pennsylvanian, Texas.

Bitubulogenerina moodysensis Cushman and Todd, Contr. Cushman Lab. Foram. Res., vol. 21, p. 98, pl. 15, figs. 25, 26. Upper Eocene, Mississippi.

Bolivina alata (Seguenza, 1862) var. *effusa* Cushman and Todd, Cushman Lab. Foram. Res., Spec. Publ. 15, p. 42, pl. 6, fig. 26. Miocene, Jamaica.

——— *davisi* Cushman and Ellisor, Jour. Paleontology, vol. 19, p. 565, pl. 76, fig. 6. Middle Oligocene, Texas.

——— *hebetata* Cushman and Todd, Cushman Lab. Foram. Res., Spec. Publ. 15, p. 47, pl. 7, fig. 15. Miocene, Jamaica.

——— *imporcata* Cushman and Todd, *ibid.*, Spec. Publ. 15, p. 47, pl. 7, fig. 14. Miocene, Jamaica. (Note: Since the species-name is preoccupied by *Bolivina floridana* Cushman, 1918, var. *imporcata* Cushman and Renz, 1944, Contr. Cushman Lab. Foram. Res., vol. 20, p. 78, this homonym subsequently was changed to *Bolivina dissentiata* Cushman and Todd, 1946, Contr. Cushman Lab. Foram., Res., vol. 22, p. 120.)

Bolivina israelskyi Cushman and Ellisor, Jour. Paleontology, vol. 19, p. 565, pl. 76, fig. 5. Middle Oligocene, Texas.

——— *moodysensis* Cushman and Todd, Contr. Cushman Lab. Foram. Res., vol. 21, p. 97, pl. 15, figs. 19, 20. Upper Eocene, Mississippi.

——— *plano-convexa* Cushman and Todd, Cushman Lab. Foram. Res., Spec. Publ., 15, p. 48, pl. 7, fig. 16. Miocene, Jamaica.

——— *pseudorobusta* Valk, in Rutten and Hotz, Geol., Petrogr. and Palaeont. Results Exped. Island Ceram, (3), Geol. No. 1, p. 24, pl. 2, figs. 9, 10. Plio-Pleistocene, Ceram.

Bolivina (?) distorqueata Cushman and Todd, Cushman Lab. Foram. Res., Spec. Publ. 15, p. 45, pl. 7, fig. 11. Miocene, Jamaica.

Bolivinoides peterssoni Brotzen, Sverig. geol. Unsersökn., Ser. C., No. 465, Arsbok 38, No. 7, p. 49, pl. 1, fig. 10. Upper Maestrichtian, Sweden.

Bulimina alazanensis Cushman, 1927, var. *spatiosa* Cushman and Todd, Cushman Lab. Foram. Res., Spec. Publ. 15, p. 40, pl. 6, fig. 12. Miocene, Jamaica.

——— *marginata* d'Orbigny, 1826, var. *tesselata* Cushman and Todd, *ibid.*, Spec. Publ. 15, p. 39, pl. 6, fig. 9. Miocene, Jamaica.

——— *sculptilis* Cushman, 1923, var. *paucicostata* Cushman and Ellisor, Jour. Paleontology, vol. 19, p. 562, pl. 75, fig. 15. Middle Oligocene, Texas.

Bulimina (Desinobulimina) illingi Cushman and Stainforth, Cushman Lab. Foram. Res., Spec., Publ. 14, p. 41, pl. 6, fig. 7. Upper Oligocene, Trinidad, B. W. I.

BULIMINIDEA superfam. nov. Glaessner, Principles of Micropalaeontology, p. 134. Includes the families: Buliminidae, Cassidulinidae, Ellipsoidinidae, and Chilostomellidae.

Cancris baragwanothi Parr, Proc. R. Soc. Victoria, vol. 56, pt. 2, p. 196, pl. 8, fig. 6; pl. 12, fig. 3. Recent, Australia.

Cassidulina caudriae Cushman and Stainforth, Cushman Lab. Foram. Res., Spec. Publ. 14, p. 64, pl. 12, figs. 2, 3. Lower Oligocene, Trinidad, B. W. I.

——— *crassa* d'Orbigny, 1839, var. *reniforme* Nørvang, The Zool. of Iceland, vol. 2, pt. 2, p. 41, text figs. 6 e–h. Recent, off Iceland.

——— *islandica* Nørvang, *ibid.*, vol. 2, pt. 2, p. 41, text figs. 7, 8 d–f. Recent, off Iceland.

——— ——— ——— forma *minuta* Nørvang, *ibid.*, vol. 2, pt. 2, p. 43, text figs. 8a–c. Recent, off Iceland.

——— *moodysensis* Cushman and Todd, Contr. Cushman Lab. Foram. Res., vol. 21, p. 102, pl. 16, figs. 9, 10. Upper Eocene, Mississippi.

——— *twiggsana* Cushman, *ibid.*, vol. 21, p. 10, pl. 2, fig. 13. Upper Eocene, Georgia.

Cassidulinoides compacta Cushman and Ellisor, Jour. Paleontology, vol. 19, p. 570, pl. 78, fig. 3. Middle Oligocene, Texas. For: *Cassidulinoides bradyi* Cushman, 1930 (non Norman, 1881), Florida Geol. Surv. Bull. 4, p. 58, pl. 11, fig. 8; for: *Cassidulinoides bradyi* Cushman and Cahill, 1933 (non Norman, 1881), U. S. Geol. Surv., Prof. Pap. 175-A, p. 33, pl. 12, fig. 4.; and for: *Cassidulinoides bradyi* Ellisor, 1940 (non Norman, 1881), Bull. Amer. Assoc. Petroleum Geologists, vol. 24, No. 3, pl. 6, fig. 5.

——— *nipeensis* F. G. Keijzer, Thesis Univ. Utrecht, p. 204, pl. 4, fig. 53. Oligo-Miocene, Cuba.

——— *simplex* Cushman and Todd, Cushman Lab. Foram. Res., Spec. Publ. 15, p. 63, pl. 10, fig. 15. Miocene, Jamaica.

Chilostomella hadleyi F. G. Keijzer, Thesis Univ. Utrecht, p. 205, pl. 4, fig. 55. Oligo-Miocene, Cuba. (Note: the species-name is incorrectly spelled "*hadlyei*" by the author.)

Chrysalidinella earlandi nom. nov. Cushman, Contr. Cushman Lab. Foram. Res. vol. 21, p. 53, pl. 8, fig. 23. Recent, Kerimba Archipelago. For: *Chrysalidina dimorpha* Heron-Allen and Earland, 1915 (non Brady, 1881), Trans, Zool. Soc. London, vol. 20, p. 632, pl. 47, figs. 29–31.

——— *fijiensis* Cushman, *ibid.*, vol. 21, p. 53, pl. 8, fig. 24. Recent, off Fiji Island, 40–50 fathoms. For: *Chrysalidinella dimorpha* Cushman, 1929, (non Brady, 1881), Jour. Washington Acad. Sci., vol. 19, p. 159, text fig. 3; and for: *Chrysalidinella dimorpha* Cushman, 1942 (non Brady, 1881) U. S. Nat. Mus. Bull. 161, pt. 3, p. 46, pl. 13, fig. 1.

——— *miocenica* Cushman, *ibid.*, vol. 21, p. 51, pl. 8, fig. 18. Miocene, Florida. For: *Chrysalidinella pulchella* Cushman, 1930 (non Cushman, 1918), Florida Geol. Surv. Bull. 4, p. 48, pl. 8, fig. 16; and for: *Chrysalidinella pulchella* Cushman and Cahill, 1933, (non Cushman, 1918), U. S. Geol. Surv., Prof. Pap. 175-A, p. 27, pl. 9, fig. 2.

Chrysalogonium asperum Cushman and Stainforth, Cushman Lab. Foram. Res., Spec. Publ. 14, p. 26, pl. 16, figs. 11, 12. Middle Oligocene, Trinidad, B.W.I.

——— *ciperense* Cushman and Stainforth, *ibid.* Spec. Publ. 14, p. 26, pl. 3, fig. 31. Lower Oligocene, Trinidad, B.W.I.

Cibicides carrascalensis Colom. Inst. Invest. Geol. "Lucas Mallada" Madrid, Estud. Geol. No. 2, p. 78, pl. 3, figs. 46–52. Lower Oligocene, Spain.

——— *concentricus* (Cushman, 1918), var. *texana* Cushman and Ellisor, Jour. Paleontology, vol. 19, p. 571, pl. 78, fig. 8. Middle Oligocene, Texas.

——— *floridana* (Cushman, 1918), subsp. *miocenica* Colom, Inst. Invest. Geol. "Lucas Mallada," Madrid, Estud. Geol. No. 3, p. 173, pl. 14, figs. 291, 295–297, 300, 303; pl. 12, fig. 248. Miocene (Vindobonian), Mallorca, Spain.

——— *formosa* Brotzen, Sverig. Geol. Undersökn., Ser. C, No. 465, Arsbok 38, No. 7, p. 55, pl. 2, fig. 3. Cenomanian, Sweden.

——— *howei* Cushman and Todd, Contr. Cushman Lab. Foram. Res., vol. 21, p. 20, pl. 4, fig. 21. Eocene, Alabama. For: *Discorbis (?) yeguaensis* Howe, 1939 (non Weinzierl and Applin, 1929), Louisiana Geol. Surv., Bull. 14, p. 75, pl. 13, figs. 15–17.

——— *plano-convexa* Cushman and Todd, *ibid.*, vol. 21, p. 104, pl. 16, figs. 18, 19. Upper Eocene Mississippi.

——— *praeconcentricus* Cushman, *ibid.*, vol. 21, p. 10, pl. 2, fig. 14. Upper Eocene, Georgia.

——— *subtenuissimus* (Nuttall, 1928) var. *concava* F. G. Keijzer, Thesis Univ. Utrecht, p. 208, pl. 4, fig. 61. Oligo-Miocene, Cuba.

Cibicides (Cibicidoides) cenomanica Brotzen, Sverig. Geol. Undersökn., Ser. C, No. 465, Arsbok 38, No. 7, p. 54, pl. 2, fig. 2. Cenomanian, Sweden.

——— (———) *turonica* Brotzen, *ibid.*, Ser. C, No. 465, Arsbok 38, No. 7, p. 53, pl. 2, fig. 1. Turonian, Sweden.

Cibicidoides see *Cibicides*.

Clavulinoides depressa Cushman and Ellisor, Jour. Paleontology, vol. 19, p. 548, pl. 71, fig. 13. Middle Oligocene, Texas.

Cornuspiroides cretacea Pérébaskine, Bull. Soc. Géol. France (5), vol. 15, p. 357, pl. 4, figs. 1, 2 (published October 1946). Upper Cretaceous, France.

Cribrobulimina cushmani Applin and Jordan, Jour. Paleontology, vol. 19, p. 134, pl. 18, fig. 5. Late Middle Eocene, Florida.

Cribrospira (?) bushnellensis Applin and Jordan, *ibid.*, vol. 19, p. 133, pl. 18, fig. 1. Paleocene, Florida.

Cribrostomum marblense Plummer, Univ. Texas Publ. 4401, p. 245, text figs. 3–11. Lower Pennsylvanian, Texas.

Cyclammina watersi Applin and Jordan, Jour. Paleontology, vol. 19, p. 133, pl. 18, fig. 2. Late Middle Eocene, Florida.

Cymbalopora irregularis F. G. Keijzer, Thesis Univ. Utrecht, p. 212, pl. 11, figs. 5–8. Middle Eocene, Cuba.

Dentalina grayi Crespin, Proc. R. Soc. Queensland, vol. 56, p. 27, pl. 3, fig. 8. Permian, Queensland.

——— *jarvisi* Cushman and Todd, Cushman Lab. Foram. Res., Spec. Publ. 15, p. 22, pl. 3, fig. 22. Miocene, Jamaica. For: *Vaginulina clavata* Cushman and Jarvis, 1930 (non Costa, 1855), Jour. Paleontology, vol. 4, p. 359, pl. 32, fig. 12; and for: *Vaginulina clavata* Palmer and Bermudez, 1936 (non Costa, 1855), Mem. Soc. Cubana Hist. Nat., vol. 10, p. 277, pl. 17, figs. 3, 4. (Note: Cushman and Todd's species-name is a homonym of Montagne, 1941, and has, subsequently been changed to *Dentalina jamaicensis* Cushman and Todd, 1946, Contr. Cushman Lab. Foram. Res., vol. 22, p. 120).

Desinobulimina see *Bulimina*.

Discocyclina raadshooveni Hermes, Thesis Univ. Utrecht, p. 26, pl. 2, figs. 1, 2; pl. 3, fig. 7. Middle (or Upper) Eocene, Cuba.

Discocyclina (*Asterocyclina*) *barbadensis* Vaughan, Geol. Soc. America, Mem. 9, p. 42, pl. 15, figs. 1–3. Middle Eocene, Barados.

——— (———) *franksi* Vaughan, *ibid.*, Mem. 9, p. 43, pl. 15, figs. 4, 5. Middle Eocene, Barbados.

——— (———) *rutteni* Vaughan, *ibid.*, Mem. 9 p. 82, pl. 30, figs. 1–5. Upper Eocene, Cuba.

Discocyclina (*Discocyclina*) *caudriae* Vaughan, *ibid.*, Mem. 9, p. 70, pl. 23, figs. 1–4. Paleocene (or Lower Eocene), Trinidad, B.W.I.

——— (———) *fonslacertensis* Vaughan, *ibid.*, Mem. 9, p. 72, pl. 24, figs. 3–6; pl. 26, fig. 3. Probably Lower Eocene, Trinidad, B.W.I. For: *Discocylina* (*Discocyclina*) *crassa* Vaughan and Cole, 1941 (non Cushman, 1919), Geol. Soc. America, Spec. Pap. 30, p. 59, pl. 20, figs. 4–7.

——— (———) *harrisoni* Vaughan, *ibid.*, Mem. 9, p. 35, pl. 11, figs. 1–5. Middle Eocene, Barbados.

——— (———) *mestieri* Vaughan, *ibid.*, Mem. 9, p. 37, pl. 12, figs. 1–6. Paleocene, Barbados.

——— (———) *turnerensis* Vaughan, *ibid.*, Mem. 9, p. 38, pl. 12, figs. 7–9. Middle Eocene, Barbados.

DISCOCYCLININAE subfam., nov. Brönnimann, Eclogae Geol. Helv., vol. 38, p. 612. (Published June 1946.) New Subfamily of Fam. Discocyclinidae Vaughan and Cole, 1940. Includes the genera: *Discocyclina s.s.*, *Aktinocyclina*, *Proporocyclina*, *Pseudophragmina s.s.*, and *Athecocyclina*. Eocene.

DISCORBIDAE fam. nov. Glaessner, Principles of Micropalaeontology, p. 145. New family of superfam. Rotaliidea Glaessner, 1945, *ut infra*. Includes subfam. Discorbinae with genera: *Discorbis*, *Valvulineria*, *Gyroidina*, *Stensjöina* (*Sic*!), *Eponides*, *Alabamina*, *Pulvinulinella*, *Parrella*, *Coleites*, and perhaps also *Baggina* and *Cancris;* subfam. Siphonininae with genera: *Siphonina*, *Siphoninella*, *Siphonoides*, and *Siphoninoides;* and subfam. Anomalininae with genera: *Cibicides*, *Planulina*, *Anomalina*, *Laticarinina*, and *Anomalinella*.

Discorbis ciperensis Cushman and Stainforth, Cushman Lab. Foram. Res., Spec. Publ. 14, p. 60, pl. 10, fig. 17. Lower Oligocene, Trinidad, B.W.I.

——— *georgiana* Cushman and Herrick, Contr. Cushman Lab. Foram. Res., vol. 21, p. 68, pl. 11, fig. 5. Eocene, Georgia.

——— *grossepunctatus* Parr, Proc. R. Soc. Victoria, vol. 56, pt. 2, p. 210, pl. 10, fig. 4. Recent, Australia.

——— *kennedyi* Parr, *ibid.*, vol. 56, pt. 2, p. 209, pl. 9, figs. 12–14. Recent, Australia.

Dorothia brevis Cushman and Stainforth, Cushman Lab. Foram. Res., Spec. Publ. 14, p. 18, pl. 2, fig. 5. Middle Oligocene, Trinidad, B.W.I.

——— *burdigalensis* Colom, Inst. Invest, Geol. "Lucas Mallada," Madrid, Estud. Geol. No. 2, p. 22, pl. 9, figs. 109–111, 117. Miocene, Burdigalian, Mallorca, Spain.

——— *inflata* Colom, Bol. R. Soc. Españ. Hist. Nat., vol. 43, p. 292, pl. 31, figs. 1–18. Miocene, Burdigalian, Mallorca, Spain.

——— *nipeensis* F. G. Keijzer, Thesis Univ. Utrecht, p. 208, pl. 1, fig. 14. Oligo-Miocene, Cuba.

Ellipsoglandulina robustior Cushman and Stainforth, Cushman Lab. Foram. Res., Spec. Publ. 14, p. 58, pl. 10, fig. 11. Upper Oligocene, Trinidad, B.W.I.

Ellipsolagena barri Cushman and Stainforth, *ibid.*, Spec. Publ. 14, p. 59, pl. 10, fig. 14. Middle Oligocene, Trinidad, B.W.I.

Ellipsonodosaria caribaea Palmer, Bull. Amer. Paleontology, vol. 29, No. 115, p. 53, pl. 1, fig. 6. Middle Miocene, Jamaica. For: *Ellipsonodosaria verneuili* Cushman and Jarvis, 1930 (non d'Orbigny, 1846), Jour. Paleontology, vol. 4, p. 364, pl. 33, fig. 12.

ELPHIDIOIDES gen., nov. Cushman, Contr. Cushman Lab. Foram. Res., vol. 21, p. 7. Fam. Nonionidae. Genotype: *Elphidioides americanus* Cushman 1945, *ut infra*. Upper Eocene.

——— *americanus* Cushman, *ibid.*, vol. 21, p. 7, pl. 2, fig. 4. Upper Eocene, Georgia

Elphidium argenteum Parr, Proc. R. Soc. Victoria, vol. 56, pt. 2, p. 216, pl. 12, fig. 7. Recent, Australia.

——— *discoidale* (d'Orbigny, 1839), var. *multiloculum* Cushman and Ellisor, Jour. Paleontology, vol. 19, p. 561, pl. 75, fig. 9. Middle Oligocene, Texas.

——— *fastigatum* Cushman, Contr. Cushman Lab. Foram. Res., vol. 21, p. 6, pl. 2, fig. 3. Upper Eocene, Georgia.

——— *leonensis* Applin and Jordan, Jour. Paleontology, vol. 19, p. 139, pl. 19, fig. 3. Oligocene, Florida

——— *nipeense* F. G. Keijzer, Thesis Univ. Utrecht, p. 199, pl. 3, fig. 42. Oligo-Miocene, Cuba.

——— *rutteni* Hermes, Thesis Univ. Utrecht, p. 36, pl. 5, fig. 6. Oligo-Miocene, Cuba.

——— *seranense* Valk, in Rutten and Hotz, Geol. Petrogr., and Palaeont. Res. Exped. Island Ceram, series 3, Geol. No. 1, p. 23, pl. 2, figs. 2, 3. Plio-Pleistocene, Ceram

——— *twiggsanum* Cushman, Contr. Cushman

Lab. Foram. Res., vol. 21, p. 6, pl. 2, fig. 2. Upper Eocene, Georgia.

Endothyra distensa Plummer, Univ. Texas Publ. 4401, p. 239, pl. 16, figs. 9–11. Lower Pennsylvanian, Texas.

Endothyranella armstrongi Plummer, 1930, subsp. *sobrina* Plummer, *ibid.* No. 4401, p. 242, pl. 16, figs. 12–17. Lower Pennsylvanian, Texas.

ENDOTHYRIDAE fam. nov. Glaessner, Principles of Micropaleontology, p. 107. New family of superfam. Endothyridea Glaessner, 1945, *ut infra*. Comprises the genera: *Endothyra, Endothyranella, Haplophragmella, Bradyina, Samarina*, and *Cribrospira*.

ENDOTHYRIDEA superfam. nov. Glaessner, *ibid.*, p. 107. Includes fam. Endothyridae Glaessner, *ut supra*, and fam. Fusulinidae.

Entosolenia acuta (Reuss, 1862) var. *bisenta* Cushman and Stainforth, Cushman Lab. Foram. Res., Spec. Publ. 14, p. 46, pl. 7, fig. 8. Upper Oligocene, Trinidad, B.W.I.

——— *crenulata* (Coryell and Rivero, 1940), var. *multispinata* Cushman and Stainforth, *ibid.*, Spec. Publ. 14, p. 46, pl. 7, fig. 7. Upper Oligocene, Trinidad, B.W.I.

——— *flintiana* (Cushman, 1923) var. *indomita* Cushman and Stainforth, *ibid.*, Spec. Publ. 14, p. 43, pl. 6, fig. 16. Upper Oligocene, Trinidad, B.W.I.

——— ——— ——— var. *plicatura* Cushman and Stainforth, *ibid.*, Spec. Publ. 14, p. 42, pl. 6, fig. 14. Oligocene, Trinidad, B.W.I.

——— *howei* nom. nov. Cushman and Todd, Contr. Cushman Lab. Foram. Res. vol. 21, p. 95, pl. 15, fig. 29. Upper Eocene, Mississippi. For: *Entosolenia orbignyana* (Seguenza, 1862) var. *elliptica* Howe, 1939, Louisiana Geol. Surv. Bull. 14, p. 64, pl. 9, fig. 14.

——— *kugleri* Cushman and Stainforth, Cushman Lab. Foram. Res., Spec. Publ. 14, p. 45, pl. 7, fig. 5. Upper Oligocene, Trinidad, B.W.I. For: *Lagena orbignyana* Nuttall, 1928, (non Seguenza, 1862), Quart. Jour. Geol. Soc. London, vol. 84, p. 80, pl. 4, fig. 2.

——— *pannosa* Cushman and Stainforth, *ibid.*, Spec. Publ. 14, p. 43, pl. 6, fig. 18. Upper Oligocene, Trinidad, B.W.I.

——— *spinolaminata* Cushman and Stainforth, *ibid.*, Spec. Publ. 14, p. 43, pl. 6, fig. 17. Upper Oligocene, Trinidad, B.W.I.

Eoschubertella inominensis Toriyama, Japan. Jour. Geol. and Geogr., vol. 20, p. 9, pl. 1, figs. 27–33. Carboniferous (probably Moscovian), Japan.

——— *minima* Toriyama, *ibid.*, vol. 20, p. 10, pl. 1, figs. 34, 35. Carboniferous (probably Moscovian), Japan.

Eponides coryelli Palmer, Bull. Amer. Paleontology, vol. 29, No. 115, p. 58, pl. 2, figs. 3, 4. Middle Miocene, Jamaica. For: *Eponides praecinctus* Coryell and Rivero, 1940 (non Karrer, 1868), Jour. Paleontology, vol. 14, p. 336, pl. 43, fig. 25.

——— *repandus* (Fichtel and Moll, 1798) var. *oligocenicus* Cushman and Ellisor, Jour. Paleontology, vol. 19, p. 569, pl. 77, fig. 7. Middle Oligocene, Texas.

——— *waltonensis* Applin and Jordan, *ibid.*, vol. 19, p. 142, pl. 19, fig. 5. Paleocene, Florida.

Eulepidina see *Lepidocyclina*.

Fabularia gunteri Applin and Jordan, Jour. Paleontology, vol. 19, p. 137, pl. 18, fig. 12. Early Middle Eocene, Florida.

Fissurina contusa Parr., Proc. R. Soc. Victoria, vol. 56, pt. 2, p. 203, pl. 9, fig. 6. Recent, Australia. For: *Lagena castrensis* (?) Brady, 1884 (non Schwager, 1866), Repts. Voyage Challenger, Zool., vol. 9, pl. 60, fig. 3.

——— *subquadrata* Parr, *ibid.*, vol. 56, pt. 2, p. 203, pl. 9, fig. 5. Recent, Australia.

Flintina avonparkensis Applin and Jordan, Jour. Paleontology, vol. 19, p. 137, pl. 18, fig. 10. Late Middle Eocene, Florida.

Frondicularia parri Crespin, Proc. R. Soc. Queensland, vol. 56, p. 27, pl. 3, figs. 9–11. Permian, Queensland.

Fusulina curta Thompson, State Geol. Surv. Kansas, Bull. 60, p. 63, pl. 6, figs. 10–16. Pennsylvanian, Colorado.

——— *prima* Thompson, *ibid.*, Bull. 60, p. 59, pl. 6, figs. 32–38. Pennyslvanian, Colorado.

——— *pristina* Thompson, *ibid.*, Bull. 60, p. 61, pl. 5, figs. 7–18. Pennsylvanian, Colorado.

Fusulina ? arenaria Thompson, Amer. Jour. Sci. vol. 243, p. 453, pl. 1, figs. 1–4, 6–11. Lower Pennsylvanian, Oklahoma.

Fusulina ? rickerensis Thompson, *ibid.*, vol. 243, p. 452, pl. 1, fig. 5; pl. 2, figs. 11–18. Lower Pennsylvanian, Texas.

Fusulinella haywardi Thompson, State Geol. Surv. Kansas, Bull. 60, p. 54, pl. 2, figs. 1–5; pl. 3, figs. 1–5. Pennsylvanian, Colorado.

——— *iowensis* Thompson, 1934, var. *leyi* Thompson, ibid., Bull. 60, p. 50, pl. 2, figs. 15–25; pl. 3, figs. 16–21; pl. 5, fig. 6. Pennsylvanian, Colorado.

——— *lounsbergi* Thompson, *ibid.*, Bull. 60, p. 53, pl. 2, figs. 6–14. Pennyslvanian, Colorado.

——— *uintaensis* Thompson, *ibid.*, Bull. 60, p. 52, pl. 3, figs. 6–16. Pennyslvanian, Colorado.

Gaudryina lapugyensis Cushman, 1936, var. *maioricensis* Colom, Inst. Invest, Geol.. "Lucas Mallada" Madrid, Estud. Geol. No. 2, p. 20, pl. 6, figs. 72, 74, 75; pl. 7, figs. 77, 78. Miocene, Burdigalian, Mallorca, Spain.

——— *pseudocollinsi* Cushman and Stainforth, Cushman Lab. Foram. Res., Spec. Publ. 14, p. 17, pl. 2, figs. 1–3. Middle Oligocene, Trinidad B.W.I.

Gaudryina (*Pseudogaudryina*) *exornata* Cushman and Ellisor, Jour. Paleontology, vol. 19, p. 548, pl. 71, fig. 12. Middle Oligocene, Texas.

——— (———) *gymnesica* Colom, Inst. Invest. Geol. "Lucas Mallada," Estud. Geol. No. 2, p. 21, pl. 8, figs. 86–88, 91–93. Miocene, Burdigalian, Mallorca, Spain.

Gaudryina (*Siphogaudryina*) *balearica* Colom, *ibid.*, Estud., geol. No. 2, p. 20, pl. 7, figs. 79–81, 84, 85. Miocene, Burdigalian, Mallorca, Spain.

Glandulina contracta Cushman and Todd, Cushman Lab. Foram. Res., Spec. Publ. 15, p. 35, pl. 5, fig. 20. Miocene, Jamaica.

Globigerina grimsdalei F. G. Keijzer, Thesis Univ. Utrecht, p. 205, text fig. 33. Oligo-Miocene, Cuba.

GLOBIGERINATELLA gen. nov. Cushman and Stainforth, Cushman Lab. Foram. Res., Spec. Publ. 14, p. 68. Fam Globigerinidae. Genotype: *Globigerinatella insueta* Cushman and Stainforth, 1945, *ut infra*. Middle Oligocene.

——— *insueta* Cushman and Stainforth, *ibid.*, Spec. Publ. 14, p. 69, pl. 13, figs. 7–9. Middle Oligocene, Trinidad, B.W.I.

Globigerinoides semiinvolutus F. G. Keijzer, Thesis Univ. Utrecht, p. 206, pl. 4, fig. 58. Upper Eocene, Cuba.

Globivalvulina bristolensis Reichel, Eclogae Geol. Helv., vol. 38, p. 556, text figs. 41 a–d. Tournaisian, England. (Published June 1946.)

——— *cyprica* Reichel, *ibid.*, vol. 38, p. 553, text figs. 39 a–f. Middle Permian, Cyprus, Greece. (Published June 1946.)

——— *graeca* Reichel, *ibid.*, vol. 38, p. 550. pl. 19, figs. 15–17; text figs. 36, 38. Permian, (probably top of Middle), Chio Island, Greece. (Published June 1946.)

——— *kantharensis* Reichel, *ibid.*, vol. 38, p. 554, text figs. 40 a–c. Permian, (probably Lower), Cyprus Island, Greece. (Published June 1946.)

——— *vonderschmitti* Reichel, *ibid.*, vol. 38, p. 556, text figs. 37 a–e. Base of Upper Permian, Hydra Island, Greece. (Published June 1946.)

Globobulimina caribbea Cushman and Bermudez, Contr. Cushman Lab. Foram. Res., vol. 21, p. 73, pl. 12, figs. 1–3. Recent, Caribbean, off southern Cuba, 700 fathoms.

——— *hannai* Cushman and Ellisor, Jour. Paleontology, vol. 19, p. 562, pl. 76, fig. 1. Middle Oligocene, Texas.

——— *pacifica* Cushman, 1927, var. *scalprata* Cushman and Todd, Cushman Lab. Foram. Res., Spec. Publ. 15, p. 40, pl. 6, fig. 15. Miocene, Jamaica. For: *Globobulimina pacifica* Cushman and Jarvis, 1930 (non Cushman, 1927), Jour. Paleontology, vol. 4, p. 362, pl. 33, fig. 6.

Globorotalia menardii (d'Orbigny, 1826) var. *miocenica* Palmer, Bull. Amer. Paleontology, vol. 29, No. 115, p. 70, pl. 1, fig. 10. Middle Miocene, Jamaica. (*Cave: Globorotalia miozea* Finlay, 1939.)

——— *praemenardii* Cushman and Stainforth, Cushman Lab. Foram. Res., Spec. Publ. 14, p. 70, pl. 13, fig. 14. Upper Oligocene, Trinidad, B.W.I.

Glomospira articulosa Plummer, Univ. Texas Publ. 4401, p. 233, pl. 16, figs. 21–25. Lower Middle Pennsylvanian, Texas.

GLOMOSPIRELLA gen. nov. Plummer, *ibid.* No. 4401, p. 233. Fam. Ammodiscidae. Genotype: *Glomospira umbilicata* Cushman and Waters, 1927, Contr. Cushman Lab. Foram. Res., vol. 3, p. 148, pl. 26, figs. 7, 8. Lower and Lower Middle Pennsylvanian.

GOURISINA gen. nov. Reichel, Eclogae Geol. Helv., vol. 38 (published June 1946), p. 539. Family not given. Genotype: *Gourisina brönnimanni* Reichel, 1945, *ut infra*. Base of Upper Permian.

——— *brönnimanni* Reichel, *ibid.*, vol. 38 (published June 1946), p. 539, pl. 19, fig. 12; text fig. 30. Base of Upper Permian, Greece.

GÜMBELINIDAE fam. nov. Glaessner, Principles of Micropaleontology, p. 151. Includes the genera: *Gümbelina*, *Tubitextularia*, *Gümbelitria*, and *Pseudotextularia*.

Guttulina lisbonensis Cushman and Todd, Contr. Cushman Lab. Foram. Res., vol. 21, p. 13, pl. 3, figs. 16, 17. Eocene, Alabama.

Gyroidina altispira Cushman and Stainforth, Cushman Lab. Foram. Res., Spec. Publ. 14, p. 61, pl. 11, fig. 1. Upper Oligocene, Trinidad, B.W.I.

——— *complanata* Cushman and Stainforth, *ibid.*, Spec. Publ. 14, p. 61, pl. 11, fig. 2. Upper Oligocene, Trinidad, B.W.I.

——— *girardana* (Reuss, 1851), var. *perampla* Cushman and Stainforth, *ibid.*, Spec. Publ. 14, p. 61, pl. 10, fig. 19. Middle Oligocene, Trinidad, B.W.I.

——— *jarvisi* Cushman and Stainforth, *ibid.*, Spec. Publ. 14, p. 62, pl. 11, fig. 3. Upper Oligocene, Trinidad, B. W. I.

Haplophragmoides confragosus Plummer, Univ. Texas Bull. 4401, p. 235, pl. 15, figs. 39–41. Lower Middle Pennsylvanian, Texas.

HEMIGORDIOPSIS gen. nov. Reichel, Verhandl. Naturf. Ges. Basel, vol. 56, p. 528. Fam. Miliolidae, Genotype: *Hemigordiopsis renzi* Reichel 1945, *ut infra*. Permian.

——— *renzi* Reichel, *ibid.*, vol. 56, p. 524, text figs. 1, 2. Middle Permian, Cyprus Island.

Heronallenia translucens Parr, Proc. R. Soc. Victoria, vol. 56, pt. 2, p. 211, pl. 9, figs. 15, 16. Recent, Australia.

Heterostegina nuda F. G. Keijzer, Thesis Univ. Utrecht, p. 212, pl. 7, fig. 104 (? fig. 112). Upper Eocene, Cuba

Hormosina glabra Cushman and Stainforth, Cushman Lab. Foram. Res., Spec. Publ. 14, p. 14, pl. 1, fig. 9. Middle Oligocene, Trinidad, B.W.I.

Hyperammina clavacoidea Plummer, Univ. Texas Publ. 4401, p. 221, pl. 15, figs. 11–14. Lower Middle Pennsylvanian, Texas.

——— *elegantissima* Plummer, *ibid.*, No. 4401, p. 222, pl. 15, figs. 17–25. Lower Middle Pennsylvanian, Texas.

Hyperamminoides expansus Plummer, *ibid.*, No. 4401, p. 223, pl. 16, figs. 1–6. Lower Middle Pennsylvanian, Texas.

Karreriella alticamerata Cushman and Stainforth, Cushman Lab. Foram. Res., Spec. Publ. 14, p. 19, pl. 2, fig. 10. Middle and Upper Oligocene, Trinidad, B.W.I.

KELYPHISTOMA gen. nov. F. G. Keijzer, Thesis Univ. Utrecht, p. 207. Family not given (Anomalinidae ?). Genotype: *Kelyphistoma ampulloloculata* F. G. Keijzer, 1945, *ut infra*. Oligo-Miocene.

——— *ampulloloculata* F. G. Keijzer, *ibid.*, p. 207, pl. 4, fig. 62. Oligo-Miocene, Cuba.

LAFFITTEINA gen. nov. Marie, Bull. Soc. Géol. France, (5), vol. 15, p. 430. (Published October 10, 1946.) Fam. Nonionidae. Genotype: *Laffitteina bibensis* Marie, 1945, *ut infra*. Paleocene Montian.

——— *bibensis* Marie, *ibid.*, vol. 15, (published October 10, 1946), p. 431, pl. 1, figs. 1–6; text figs. 1–3. Montian, (Paleocene), France.

——— *monodi* Marie, *ibid.*, vol. 15 (published October 10, 1946), p. 433, text figs. 4–13, 17–23. Paleocene, Montian, Mauritania, French West Africa.

Lagena ciperensis Cushman and Stainforth, Cushman Lab. Foram. Res., Spec. Publ. 14, p. 30, pl. 4, fig. 18. Lower Oligocene, Trinidad, B.W.I.

——— *crenata* (Parker and Jones, 1865), var. *capistrata* Cushman and Stainforth, *ibid.*, Spec. Publ. 14, p. 30, pl. 4, fig. 16. Middle and Upper Oligocene, Trinidad, B.W.I.

——— *distoma-margaritifera* Parker and Jones, 1865, var. *victoriensis* Parr, Proc. R. Soc. Victoria, vol. 56, pt. 2, p. 202, pl. 12, fig. 6. Recent, Australia.

——— *pulcherrima* Cushman and Jarvis, 1929, var. *enitens* Cushman and Stainforth, Cushman Lab. Foram. Res., Spec. Publ. 14, p. 29, pl. 4, fig. 13. Lower Oligocene, Trinidad, B.W.I.

——— *rutschi* Cushman and Stainforth, *ibid.*, Spec. Publ. 14, p. 31, pl. 4, figs. 23, 24. Oligocene, Trinidad, B.W.I.

——— *striata* d'Orbigny, 1839) var. *basisenta* Cushman and Stainforth, *ibid.*, Spec. Publ. 14, p. 29, pl. 4, fig. 5. Upper Oligocene, Trinidad, B.W.I.

——— *waringi* Cushman and Stainforth, *ibid.*, Spec. Publ. 14, p. 31, pl. 4, fig. 20. Upper Oligocene, Trinidad, B.W.I.

LAGENIDEA superfam, nov. Glaessner, Principles of Micropalaeontology, p. 126. Comprises the fam. Lagenidae and Polymorphinidae.

LASIODISCUS gen. nov. Reichel, Eclog. geol. Helv. vol. 38 (published June 1946), p. 525. Family not stated (Rotaliidae ?). Genotype: *Lasiodiscus granifer* Reichel, 1945, *ut infra*. Upper Permian.

——— *divergens* Reichel, *ibid.*, vol. 38 (published June 1946), p. 529, pl. 19, fig. 4; text figs. 9, 10. Upper Permian, Greece.

——— *granifer* Reichel, *ibid.*, vol. 38 (published June 1946), p. 529, pl. 19, figs. 1, 2; text figs. 1, 2, 12. Upper Permian, Cyprus Island.

——— *minor* Reichel, *ibid.*, vol. 38 (published June 1946), p. 530, text fig. 6. Upper Permian, Cyprus Island.

——— *tenuis* Reichel, *ibid.*, vol. 38 (published June 1946), p. 530, pl. 19, fig. 3; text fig. 3. Upper Permian, Greece.

LASIOTROCHUS gen. nov. Reichel, *ibid.*, vol. 38 (published June 1946), p. 531. Family not stated (Rotaliidae ?). Genotype: *Lasiotrochus tatoiensis* Reichel, 1945, *ut infra*. Upper Permian. (Note: *cave Lasiotrechus* Ganglbauer, 1892, Coleoptera.)

——— *tatoiensis* Reichel, *ibid.*, vol. 38 (published June 1946), p. 531, pl. 19, fig. 5; text fig. 11. Upper Permian, Greece.

Laticarinina hispanica Colom, Inst. Invest. Geol. "Lucas Mallada," Madrid, Estud. Geol. No. 2, p. 77, pl. 3, figs. 65–67. Lower Oligocene, Spain.

Lepidocyclina leonensis Cole, Florida Geol. Surv. Bull. 28, p. 32, pl. 5, figs. 11–17; pl. 11, fig. 3. Oligocene, Florida.

——— *thikombiaensis* Cole, B. P. Bishop Museum Bull. 181, p. 296, pl. 30, figs. D, E. Upper part of Lower Miocene, Lau, Fiji Islands.

Lepidocyclina (*Eulepidina*) *oneataensis* Cole, *ibid.*, Bull. 181, p. 292, pl. 26, figs. A–J; pl. 28, fig. H. Upper part of Lower Miocene, Lau, Fiji Islands.

Lepidocyclina (*Multilepidina*) *fijiensis* Cole, *ibid.*, Bull. 181, p. 285, pl. 22, figs. A–D. Upper part of Lower Miocene, Lau, Fiji Islands.

Lepidocyclina (*Nephrolepidina*) *plummerae* Cole, *ibid.*, Bull. 181, p. 289, pl. 23, figs. A, B. Upper Part of Lower Miocene, Lau, Fiji Islands.

——— (———) *rutteni* van der Vlerk, 1924, var. *lauensis* Cole, *ibid.*, Bull. 181, p. 290, pl. 26, figs. H, I,; pl. 28, fig. A. Upper part of Lower Miocene, Lau, Fiji Islands.

——— (———) *sanfernandensis* Vaughan and Cole, 1941, var. *tallahasseensis* Cole, Florida Geol. Surv. Bull. 28, p. 34, pl. 1, figs. 16, 17; pl. 2, figs. 5–7; pl. 3, figs. 1–6. Upper Eocene, Florida.

——— (———) *suwannensis* Cole, *ibid.*, Bull. 28, p. 39, pl. 4, figs. 5, 8–10; pl. 7, figs. 1, 14; pl. 11, figs. 6, 7, 11. Oligocene, Florida.

Lepidocyclina (*Polylepidina*) *barbadensis* Vaughan, Geol. Soc. America, Mem. 9, p. 49, pl. 19, figs. 5–9. Paleocene, Barbados.

Listerella guantanamensis F. G. Keijzer, Thesis Univ. Utrecht, p. 192, pl. 2, fig. 20. Lower Oligocene, Cuba. (Note: this species has to be allocated to the genus *Schenckiella*.)

Lituonella inflata F. G. Keijzer, *ibid.*, p. 210, pl. 5, fig. 66. Upper Eocene, Cuba, For: *Lituonella sp.* Cushman, 1936, Cushman Lab. Foram. Res., Spec. Publ. 8, p. 185, pl. 22, fig. 14.

LITUOLIDEA superfam, nov. Glaessner, Principles of Micropaleontology, p. 93. Includes the families: Rheophacidae, Lituolidae, Orbitolinidae, Textulariidae, Trochamminidae, and Verneuilinidae.

Lockhartia cushmani Applin and Jordan, Jour. Paleontology, vol. 19. p. 143, pl. 21, fig. 5. Early Middle Eocene, Florida. For: *Truncatulina sp.* Cushman, 1921. Florida Geol. Surv. 13th Ann. Rept., p. 52, pl. 3, fig. 1.

Loxostomum capriciosum F. G. Keijzer, Thesis, Univ. Utrecht, p. 201, pl. 3, fig. 52. Oligo-Miocene, Cuba.

——— *formosum* Cushman and Todd, Cushman Lab. Foram. Res., Spec. Publ. 15, p. 48, pl. 7, fig. 17, Miocene, Jamaica.

Marginulina augens Cushman and Todd, *ibid.*, Spec. Publ. 15, p. 19, pl. 3, fig. 4. Miocene, Jamaica. For: *Marginulina glabra* Terrigi, 1891 (non d'Orbigny, 1826), Mem. Comm. Geol. Italia, vol. 4, pt. 1, p. 93, pl. 3, fig. 5.

——— *costata* (Batsch, 1791) var. *caribbeana* F. G. Keijzer, Thesis Univ. Utrecht, p. 196, pl. 3, fig. 30. Oligo-Miocene, Cuba. For: *Marginulina sp.* Nuttall, 1932, Jour. Paleontology, vol. 6, p. 13, pl. 3, fig. 4.

——— *ellisi* Cushman and Ellisor, Jour. Paleontology, vol. 19, p. 554, pl. 73, figs. 17, 18. Middle Oligocene, Texas.

——— *garrettii* Cushman and Ellisor, *ibid.*, vol. 19, p. 555, pl. 73, figs. 21–24. Middle Oligocene, Texas.

——— *moodysensis* Cushman and Todd, Contr. Cushman Lab. Foram. Res., vol. 21, p. 85, pl. 14, figs. 1, 2. Upper Eocene, Mississippi.

——— *sublituus* (Nuttall, 1932) var. *multicamerata* Cushman and Stainforth, Cushman Lab. Foram. Res., Spec. Publ. 14, p. 23, pl. 3, figs. 6, 7. Upper Oligocene, Trinidad, B.W.I.

———*tschoppi* F. G. Keijzer, Thesis Univ. Utrecht, p. 197, pl. 2, fig. 27. Oligo-Miocene, Cuba.

Marssonella oxycona (Reuss, 1860) var. *floridana* Applin and Jordan, Jour. Paleontology, vol. 19, p. 135. Not figured. Paleocene, Florida. For: *Gaudryina trochoides* White, 1928 (non Marsson, 1878), Jour. Paleontology, vol. 2, p. 314 pl. 42, fig. 11; for *Gaudryina oxycona* Cushman and Jarvis, 1932 (non Reuss, 1860), Proc. U. S. Nat. Mus., vol. 80, Art. 14, p. 18, pl. 5, fig. 1 (non fig. 2); and for: *Marssonella oxycona* Cushman, 1937 (non Reuss, 1860), Cushman Lab. Foram. Res., Spec. Publ. 8, pl. 6, fig. 9a only.

MILIOLIDEA superfam, nov. Glaessner, Principles of Micropalaeontology, p. 116. Comprises the families: Miliolidae, Ophthalmidiidae, Peneroplidae, and Alveolinidae.

Millerella circuli Thompson, State Geol. Surv. Kansas, Bull. 60, p. 46, pl. 1, figs. 15–18. Pennsylvanian, Utah.

——— *inflecta* Thompson, *ibid.*, Bull. 60, p. 44, pl. 1, figs. 1–7; pl. 5, figs. 2, 3; text fig. 11. Pennsylvanian, Colorado.

Millettella elongata Cushman, Contr. Cushman Lab. Foram. Res., vol. 21, p. 2, pl. 1, fig. 5. Upper Eocene, Georgia.

——— *eocenica* Cushman, *ibid.*, vol. 21, p. 2, pl. 1, fig. 4. Upper Eocene, Georgia.

Miscellanea nassauensis Applin and Jordan, Jour. Paleontology, vol. 19, p. 139, pl. 19, fig. 4. Lower Eocene, Florida, For: *Miscellanea sp.* Applin and Jordan, 1944, Bull Amer. Assoc. Petroleum Geologists, vol. 27, pl. 4, fig. 1.

Multilepidina see *Lepidocyclina.*

Nephrolepidina see *Lepidocyclina.*

Nodogenerina rohri Cushman and Stainforth, Cushman Lab. Foram. Res., Spec. Publ. 14, p. 39, pl. 5, fig. 26. Upper Oligocene, Trinidad, B.W.I.

Nodosarella reflecta Cushman and Stainforth, *ibid.*, Spec. Publ. 14, p. 54, pl. 9, figs. 6, 7. Lower Oligocene, Trinidad, B.W.I.

Nodosaria fusta Cushman and Todd, *ibid.*, Spec. Publ. 15, p. 28, pl. 4, figs. 20–22. Miocene, Jamaica.

——— *lamellata* Cushman and Stainforth, *ibid.*, Spec. Publ. 14, p. 24, pl. 3, figs. 23, 24. Middle and Upper Oligocene, Trinidad, B. W. I. For: *Dentalina carinata* Neugeboren, 1856 (non d'Orbigny, 1826), Denkschr, K. K. Akad. Wiss. Wien, vol. 12, p. 91, pl. 4, fig. 17; for: *Nodosaria aff. carinata* (Neugeboren) in: Nuttall, 1932, Jour. Paleontology, vol. 6, p. 16, pl. 3, fig. 11; and in: Franklin, 1944, Jour. Paleontology, vol. 18, p. 311, pl. 46, fig. 7.

——— *serocoldensis* Crespin, Proc. R. Soc. Queensland, vol. 56. p. 26, pl. 3, fig. 6. Permian, Queensland.

——— *springsurensis* Crespin, *ibid.*, vol. 56, p. 26, pl. 3, fig. 5. Permian, Queensland.

Nonion jamaicensis Cushman and Todd, Cushman Lab. Foram. Res., Spec. Publ. 15, p. 36, pl. 6, fig. 1. Miocene, Jamaica.

——— *nipeense* F. G. Keijzer, Thesis Univ. Utrecht, p. 199, pl. 3, fig. 39. Oligo-Miocene, Cuba.

——— *whitsettense* (Cushman and Applin, 1926) var. *insueta* Cushman, Contr. Cushman Lab. Foram. Res., vol. 21, p. 5, pl. 1, figs. 17–19. Upper Eocene, Alabama.

Nonionella jacksonensis Cushman, 1933, var. *compressa* Cushman and Todd, *ibid.*, vol. 21, p. 93, pl. 15, fig. 7. Upper Eocene, Mississippi.

——— *kingmai* Hermes, Thesis Univ. Utrecht, p. 36, pl. 5, fig. 5. Oligo-Miocee, Cuba.

——— *leonensis* Applin and Jordan, Jour. Paleontology, vol. 19, p. 138, pl. 19, fig. 2. Oligocene, Florida.

——— *turgida* (Williamson, 1858) var, *digitata* Nørvang, The Zool. of Iceland, vol. 2, pt. 2, p. 29, text fig. 4. Recent, off Iceland, 141 meters.

OLYMPINA gen. nov. Reichel, Eclog. geol. Helv., vol. 38 (published June 1946), p. 540. Family not given. Genotype: *Olympina insolita* Reichel 1945, *ut infra.* Upper Permian. [Note: *cave Olympia* Risso 1826 (Crust.), and *Olympia* Vest, 1867 (Moll.)]

——— *insolita* Reichel, *ibid.*, vol. 38 (published June 1946), p. 540, pl. 19, fig. 11; text fig. 31. Upper Permian, Cyprus Island.

Operculina (*Sulcoperculina*) *cosdeni* Applin and Jordan, Jour. Paleontology, vol. 19, p. 140, pl. 20, fig. 2. Upper Cretaceous, Florida. For: *Miscellanea dickersoni* in: Cole, 1944, Florida Geol. Surv. Bull. 26, p. 38, pl. 21, figs. 8–11.

Operculina mbalavuensis Cole, B. P. Bishop Museum Bull. 181, p. 278, pl. 12, figs. L, M. Upper part of Lower Miocene, Lau, Fiji Islands.

ORBITOCLYPEINAE subfam, nov. Brönnimann, Eclog. geol. Helv., vol. 38 (published June 1946). New subfamily of Discocyclinidae Vaughan and Cole, 1940. Includes the genera: *Orbitoclypeus* and *Asterocyclina.*

ORBITOLINOIDES gen. nov. Vaughan, Geol. Soc. America, Mem. 9, p. 22. Fam. Orbitolinidae Martin 1890. Genotype: *Orbitolinoides senni* Vaughan, 1945, *ut infra.* Middle Eocene.

——— *senni* Vaughan, *ibid.*, Mem. 9, p. 23, pl. 2, figs. 1–5. Middle Eocene, Barbados.

PARATHURAMMINA gen. nov. Suleimanov, Comptes-Rendus (Doklady) Acad. Sci. U.R.S.S., vol. 48, p. 126. Fam. Saccamminidae. Genotype: *Parathurammina dagmarae* Suleimanov, 1945, *ut infra.* Etroeungt (Carboniferous).

——— *cuchmani* Suleimanov, *ibid.*, vol. 48, p. 127, text fig. 5. Etroeungt (Carboniferous), U.R.S.S.

——— *dagmarae* Suleimanov, *ibid.*, vol. 48, p. 126, text fig. 3, Etroeungt (Carboniferous), U.R.S.S.
——— *oldae* Suleimanov, *ibid.*, vol. 48, p. 126, text fig. 4. Etroeungt (Carboniferous), U.R.S.S.
Planispira ? kissengenensis Applin and Jordan, Jour. Paleontology, vol. 19, p. 138, pl. 19, fig. 1. Paleocene, Florida.
Planularia anahuacana Cushman and Ellisor, *ibid.*, vol. 19, p. 554, pl. 73, figs. 7, 8. Middle Oligocene, Texas.
——— *formosa* F. G. Keijzer, Thesis Univ. Utrecht, p. 195, pl. 5, fig. 74. Oligo-Miocene, Cuba.
——— *georgiana* Cushman and Herrick, Contr. Cushman Lab. Foram. Res., vol. 21, p. 57, pl. 9, fig. 7. Eocene, Georgia.
——— *woodringi* Palmer, Bull. Amer. Paleontology, vol. 29, Nr. 115, p. 37, pl. 1, fig. 7. Middle Miocene, Jamaica.
Planulina marialana Hadley, 1934, var. *gigas* F. G. Keijzer, Thesis Univ. Utrecht, p. 206, pl. 5, fig. 77. Oligo-Miocene, Cuba.
——— *renzi* Cushman and Stainforth, Cushman Lab. Foram. Res., Spec. Publ. 14, p. 72, pl. 15, fig. 1. Upper Oligocene, Trinidad, B.W.I.
——— *ruizi* Colom, Inst. Invest. Geol. "Lucas Mallada" Madrid, Estud. Geol. Nr. 2, p. 43, pl. 3, figs. 53–61. Priabonian, Spain.
——— *waltonensis* Applin and Jordan, Jour. Paleontology, vol. 19, p. 147, pl. 20, fig. 5. Paleocene, Florida.

Plectina humblei Cushman and Ellisor, *ibid.*, vol. 19, p. 548, pl. 71, fig. 15. Middle Oligocene, Texas.
Plectofrondicularia jarvisi Cushman and Todd, Cushman Lab. Foram. Res., Spec. Publ. 15, p. 38, pl. 6, fig. 4. Miocene, Jamaica. For: *Plectofrondicularia vaughani* Cushman and Jarvis, 1930 (non Cushman, 1927), Jour. Paleontology, vol. 4, p. 361, pl. 33, fig. 4; for same reference in Cushman, 1933, Cushman Lab. Foram. Res., Spec. Publ. 5, pl. 26, fig. 27; for same reference in Coryell and Rivero, 1940, Jour. Paleontology, vol. 14, p. 341, pl. 42, fig. 28; and for same reference in Cushman, 1940, Foraminifera, 3rd edition, Key, pl. 26, fig. 27.
——— *nuttalli* Cushman and Stainforth, *ibid.*, Spec. Publ. 14, p. 39, pl. 5, figs. 21–23. Middle Oligocene, Trinidad, B.W.I.
——— ——— ——— var. *acuta* Cushman and Stainforth, *ibid.*, Spec. Publ. 14, p. 39, pl. 5, fig. 24. Upper Oligocene, Trinidad, B.W.I.
——— *morreyae* Cushman, 1929, var. *exigua* Cushman and Stainforth, *ibid.*, Spec. Publ. 14, p. 38, pl. 5, fig. 18. Upper Oligocene, Trinidad, B.W.I.
——— *ruthvenmurrayi* Cushman and Stainforth, *ibid.*, Spec. Publ. 14, p. 37, pl. 5, fig. 14. Upper Oligocene, Trinidad, B.W.I.
Pleurostomella bierigi Palmer and Bermudez, 1936, var. *hebeta* Cushman and Stainforth, *ibid.*, Spec. Publ. 14, p. 52, pl. 8, fig. 16. Middle Oligocene, Trinidad, B.W.I.
——— *praegerontica* Cushman and Stainforth, *ibid.*, Spec. Publ. 14, p. 52, pl. 8, figs. 13, 14. Middle Oligocene, Trinidad, B.W.I.

Polylepidina see *Lepidocyclina*.
Polymorphinella curta Cushman and Ellisor, Jour. Paleontology, vol. 19, p. 559, pl. 74, fig 21. Middle Oligocene, Texas.
Proporocyclina see *Pseudophragmina*.
Proteonina eocenica Cushman, Contr. Cushman Lab. Foram. Res., vol. 21, p. 1, pl. 1, figs. 1, 2. Upper Eocene, Georgia.
——— *prolixa* Cushman, *ibid.*, vol. 21, p. 2, pl. 1, fig. 3. Upper Eocene, Georgia.
Pseudoclavulina moorevillensis Cushman and Applin, *ibid.*, vol. 21, p. 74, pl. 12, figs. 4, 5. Upper Cretaceous, Alabama.
Pseudogaudryina see *Gaudryina*.
Pseudoglandulina diminuta Cushman and Todd, Cushman Lab. Foram. Res., Spec. Publ. 15, p. 30, pl. 4, fig. 27. Miocene, Jamaica.
——— *gallowayi* Cushman, 1929, var. *sparsicostata* F. G. Keijzer, Thesis Univ. Utrecht, p. 198, pl. 3, fig. 35. Oligo-Miocene, Cuba.
PSEUDOGOËSELLA gen. nov. F. G. Keijzer, ibid., p. 190. Fam. Valvulinidae; subfam. Eggerellinae. Genotype: *Pseudogoësella cubana*, F. G. Keijzer, 1945, *ut infra*. Upper Eocene.
——— *cubana* F. G. Keijzer, *ibid.*, p. 191, pl. 5, fig. 67. Upper Eocene, Cuba.
Pseudophragmina (*Athecocyclina*) *jukes-brownei* Vaughan, Geol. Soc. America, Mem. 9, p. 48, pl. 16, figs. 5–7. Middle Eocene, Barbados.
——— (———) *macglameriae* Vaughan, *ibid.*, Mem. 9, p. 102, pl. 46, figs. 1–5. Paleocene, Alabama.
——— (———) *soldadensis* Vaughan and Cole, 1941, var. *calebardensis* Vaughan, *ibid.*, Mem. 9, p. 46, pl. 17, figs. 1–8; pl. 18, figs. 1, 1a. Paleocene, Barbados.
Pseudophragmina (*Proporocyclina*) *palmerae* Vaughan, *ibid.*, Mem. 9, p. 97, pl. 41, figs. 1–3. Upper Eocene, Cuba.
——— (———) *schomburgki* Vaughan, *ibid.*, Mem. 9, p. 45, pl. 16, figs. 1–4a. Middle Eocene, Barbados.
Pseudophragmina (*Pseudophragmina*) *bainbridgensis* (Vaughan, 1928) var. *angusta* Vaughan, *ibid.*, Mem. 9, p. 87, pl. 34, figs. 5–7. Upper Eocene, Cuba.
——— (———) ——— ——— var. *obsoleta* Vaughan, *ibid.*, Mem. 9, p. 87, pl. 33, fig. 5; pl. 34, fig. 4. Upper Eocene, Cuba.
——— (———) *novitasensis* Vaughan, *ibid.*, Mem. 9, p. 88, pl. 35, figs. 1–4a. Upper Eocene, Cuba.
Pseudouvigerina rugosa Brotzen, Sverig. Geol. Undersokn., series C, No. 465, Arsbok 38, No. 7, p. 47, pl. 1, fig. 7. Upper Maestrichtian, Sweden.
Pseudovalvulineria vombensis Brotzen, *ibid.*, No. 465, Arsbok 38, No. 7, p. 50, pl. 1, figs. 12, 13; text fig. 9. Lower Campanian, Sweden. For: *Rotalia beccariiformis* var. White, 1928, Jour. Paleontology, vol. 2, p. 287, pl. 39, figs. 3, 4.
Pullenia trinitatensis Cushman and Stainforth, Cushman Lab. Foram. Res., Spec. Publ. 14, p. 66, pl. 12, fig. 11. Lower Oligocene, Trinidad, B.W.I.
Pulvinulinella reticulata F. G. Keijzer, Thesis Univ. Utrecht, p. 204, pl. 4, fig. 59. Lower Oligocene, Cuba
Pyramis radicula Reichel, Eclog. geol. Helv., vol.

38 (published June, 1946), p. 547, text fig. 35a. Upper Permian, Greece. (Note: Since *Pyramis* Colani, 1924, as a generic name is already preoccupied by Bolten, 1798, Schumacher, 1817, Otto, 1821, Brown, 1827, Coutony, 1839, Putzeys, 1846, and Haeckel, 1887, it should be allocated to the genus *Colaniella* Licharew, 1939, *ut infra*.) (See supplement to Index for the year 1939.)

Pyrulina cylindroides (Roemer, 1838) var. *curvatura* Cushman and Stainforth, Cushman Lab. Foram. Res., Spec. Publ. 14, p. 34, pl. 4, figs. 32, 33. Lower Oligocene, Trinidad, B.W.I.

Quinqueloculina adelaidensis Howchin and Parr, 1938, var. *minuta* F. G. Keijzer, Thesis Univ. Utrecht, p. 193, pl. 2, fig. 21. Oligo-Miocene, Cuba.

——— *annettae* nom. nov. Nicolas, Bull. Mus. Nation. Hist. Nat. Paris, (2), vol. 17, p. 436. Eocene, Paris Basin, France. New name for: *Adelosina striata* d'Orbigny, 1826, Ann. Sc. Nat. vol. 7, No. 2, Modèles Nrs. 18 and 97.

——— *byramensis* nom. nov. Hermes, Thesis Univ. Utrecht, p. 35, pl. 5, fig. 3. Oligo-Miocene, Cuba. New name for: *Quinqueloculina bicostata* Cushman, 1922 (non d'Orbigny, 1839), U. S. Geol. Surv., Prof. Pap. 129-E, p. 102, pl. 26, figs. 2–4. (Note: This new name is preoccupied by *Quinqueloculina byramensis* Cushman, 1923, U. S. Geol. Surv. Prof. Pap. 133, p. 54, pl. 8, fig. 5, from the Oligocene of Mississippi.)

——— *crassiformis* Cushman and Ellisor, Jour. Paleontology, vol. 19, p. 549, pl. 72, fig. 3. Middle Oligocene, Texas

——— *leonensis* Applin and Jordan, *ibid.*, vol. 19, p. 136, pl. 18, fig. 9. Oligocene, Florida.

——— *mauricensis* Howe, 1939, var. *lisbonensis* Cushman and Todd, Contr. Cushman Lab. Foram. Res., vol. 21, p. 12, pl. 3, figs. 7, 8. Eocene, Alabama.

——— *moodysensis* Cushman and Todd, *ibid.*, vol. 21, p. 81, pl. 13, fig. 8. Upper Eocene, Mississippi. For: *Quinqueloculina laevigata* Cushman, 1935 (non d'Orbigny, 1878), U. S. Geol. Surv. Prof. Pap. 181, p. 11, pl. 2, figs. 13–15.

——— *nitida* Nørvang, The Zool. of Iceland, vol. 2, pt. 2, p. 7, text fig. 1. Recent, off Iceland. [This species is preoccupied by *Triloculina* (*Quinqueloculina*) *nitida* d'Orbigny, 1839, in Barker, Webb and Berthelot, Hist. Nat. Iles Canaries, vol. 2, pt. 2 "Foraminifères," p. 141, pl. 3, figs. 22–24.]

——— *quadrata* nom. nov. Nørvang, *ibid.*, vol. 2, pt. 2, p. 7. Not figured. Recent, Arctic and Boreal regions of Atlantic. New name for: *Quinqueloculina sclerotica* Cushman, 1929 (non Karrer, 1868), U. S. Nat. Mus., Bull. 104, pt. 6, p. 24, pl. 1, fig. 5.

——— *subpolygona* Parr, Proc. R. Soc. Victoria, vol. 56, pt. 2, p. 196, pl. 12, fig. 2. Recent, Australia.

——— *tuberculata* Cushman and Todd, Contr. Cushman Lab. Foram. Res., vol. 21, p. 81 pl. 13, figs. 11, 12. Upper Eocene, Mississippi.

Rectobolivina digitata Parr, Proc. R. Soc. Victoria, vol. 56, pt. 2, p. 206, pl. 9, fig. 10. Recent, Australia.

Rectogümbelina inopinata Cushman and Stainforth, Cushman Lab. Foram. Res., Spec. Publ. 14, p. 35, pl. 5, fig. 27. Lower Oligocene, Trinidad, B.W.I.

RECTUVIGERINA gen. nov. Mathews, Jour. Paleontology, vol. 19, p. 590. Fam. Uvigerinidae; subfam. Uvigerininae. Genotype: *Siphogenerina multicostata* Cushman and Jarvis, 1929, Contr. Cushman Lab. Foram. Res., vol. 5, p. 14, pl. 3, fig. 6. Eocene to Recent.

RECTUVIGERINA subgen. nov. Mathews, *ibid.*, vol. 19, p. 598. Subgenus of *Rectuvigerina* Mathews, 1945, *ut supra*. Fam. Uvigerinidae, subfam. Uvigerininae. Subgenotype: same as for genotype, *ut supra*. Eocene to Recent.

——— *nicoli* Mathews, *ibid.*, vol. 19, p. 593, pl. 81, fig. 2. Recent, Mediterranean Sea. For: *Uvigerina* (*Sagrina*) *nodosa* Parker and Jones, 1865 (non d'Orbigny, 1826), Phil. Trans. R. Soc. London, vol. 55, p. 363, pl. 18, fig. 15; for: *? Sagrina nodosa* Brady, 1884 (non Parker and Jones, 1865), Rept. Voyage Challenger, Zool., vol. 9, pt. 5, p. 583, pl. 114, fig. 18; and for *Siphogenerina nodosa* Thalmann, 1932 (non Parker and Jones, 1865), Eclog. geol. Helv., vol. 25, p. 312.

Reophax bensensis Plummer, Univ. Texas Publ. 4401, p. 226, pl. 17, figs. 7–9. Lower Pennsylvanian, Texas.

——— *emaciatus* Plummer, *ibid.*, p. 227, pl. 17, figs. 18–22. Lower Middle Pennsylvanian, Texas.

——— *expatiatus* Plummer, *ibid.*, p. 228, pl. 17, figs. 4–6. Lower Middle Pennsylvanian, Texas.

——— *minutissimus* Plummer, *ibid.*, p. 230, pl. 17, figs. 25–30. Lower Middle Pennsylvanian, Texas.

——— *morrisoni* Cushman and Ellisor, Jour. Paleontology, vol. 19, p. 545, pl. 71, figs. 2–4. Middle Oligocene, Texas.

——— *tumidulus* Plummer, Univ. Texas Bull. 4401, p. 231, pl. 17, fig. 31. Lower Middle Pennsylvanian.

Reussella aculeata Cushman, Contr. Cushman Lab. Foram. Res., vol. 21, p. 41, pl. 7, figs. 10, 11. Recent, Pacific, off Fiji Islands. For: *Verneuilina spinulosa* Brady, 1884 (non Reuss, 1850), Rept. Voyage Challenger, Zool., vol. 9, p. 384, pl. 47, fig. 2 ?, 3.

——— *aperta* Cushman, *ibid.*, vol. 21, p. 35, pl. 6, fig. 13. Miocene, Roumania.

——— *insueta* Cushman, *ibid.*, vol. 21, p. 40, pl. 7, fig. 9. Recent, Pacific, off Fiji.

——— *miocenica* Cushman, *ibid.*, vol. 21, p. 36, pl. 6, figs. 19, 20. Miocene, Florida. For: *Reussia spinulosa* (Reuss) in: Cushman, 1930, Florida State Geol. Surv. Bull. 4, p. 48, pl. 8, fig. 7; Cushman and Ponton, 1932, *ibid.*, Bull. 9, p. 84, pl. 12, fig. 14, ? 16 (not fig. 15); and Cushman and Cahill, 1933, U. S. Geol. Surv., Prof. Pap. 175-A, p. 27, pl. 9, fig. 1.

——— *pulchra* Cushman, *ibid.*, vol. 21, p. 34, pl. 6, figs. 11, 12. Miocene, Austria. For: *Verneuilina spinulosa* Macfadyen, 1931 (non

Reuss, 1850), Geol. Surv. Egypt (1930), 1931, p. 50, pl. 1, fig. 8.

——— *rectimargo* (Cushman, 1922) var. *hebetata* Cushman, *ibid.*, vol. 21, p. 32, pl. 6, figs. 4, 5. Oligocene, Mississippi. For: *Verneuilina spinulosa* Reuss var. *glabrata* Cushman, 1922 (non *V. glabrata* Cushman, 1918), U. S. Geol. Surv. Prof. Pap. 129-E, p. 92, and *ibidem*, Prof. Pap. 133, 1923, p. 21; and for: *Reussella spinulosa* (Reuss) var. *glabrata* Cushman, in Cushman and MacGlamery, 1942, U. S. Geol. Surv. Prof. Pap. 197-B, p. 72, pl. 6, fig. 3.

——— *spinulosa* (Reuss, 1850) var. *laevigata* Cushman, *ibid.*, vol. 21, p. 34, pl. 6, fig. 10. Miocene, France.

——— *terquemi* Cushman, *ibid.*, vol. 21, p. 28, pl. 5, figs. 15, 16. Eocene, France. For: *Verneuilina spinulosa* Terquem, 1882 (non Reuss, 1850), Mém. Soc. géol. France (3), vol. 2, p. 107, pl. 11 (19), fig. 16.

RHAPYDIONININAE subfam. nov. F. G. Keijzer, Thesis Univ. Utrecht, p. 200. New subfam. of fam. Peneroplidae. Includes the genera: *Praerhapydionina*, *Rhapydionina*, and *Taberina*

RIMALINA gen. nov. Pérébaskine, Bull. Soc. géol. France, (5), vol. 15 (published October 10, 1946), p. 359. Family not given (Lagenidae, subfam. Nodosariinae). Genotype: *Rimalina pinatensis* Pérébaskine, 1945, *ut infra*. (Note: *cave Rimulina* d'Orbigny, 1826.) Upper Cretaceous.

——— *pinatensis* Pérébaskine, *ibid.*, (5), vol. 15, p. 359, pl. 4, figs. 6, 9. Upper Cretaceous, France (published October 1946).

——— ——— ——— var. *grandis* Pérébaskine, *ibid.*, (5), vol. 15, p. 360, pl. 4, figs. 7, 10. Upper Cretaceous, France (published October 1946).

——— ——— ——— var. *longa* Pérébaskine, *ibid.*, (5), vol. 15, p. 360, pl. 4, figs. 5, 8. Upper Cretaceous, France (published October 1946).

Robertina moodysensis Cushman and Todd, Contr. Cushman Lab. Foram. Res., vol. 21, p. 94, pl. 15, figs. 10, 11. Upper Eocene, Mississippi. For: *Robertina cf. angusta* (Cushman) in Cushman, 1945, Contr. Cushman Lab. Foram. Res., vol. 21, p. 8, pl. 2, fig. 5.

ROBULOIDES gen. nov. Reichel, Eclog. geol. Helv., vol. 38 (published June, 1946), p. 531. Family not given (Lagenidae). Genotype: *Robuloides lens* Reichel, 1945, *ut infra*. Upper Permian.

——— *acutus* Reichel, *ibid.*, vol. 38 (published June 1946), p. 537, pl. 19, figs. 8, 9; text figs. 27–29. Upper Permian, Greece.

——— *gibbus* Reichel, *ibid.*, vol. 38 (published June 1946), p. 537, pl. 19, fig. 10; text figs. 14–17. Upper Permian, Hydra Island, Greece.

——— *gourisiensis* Reichel, *ibid.*, vol. 38 (published June 1946), p. 538, text figs. 19, 20. Upper Permian, Greece.

——— *lens* Reichel, *ibid.*, vol. 38 published June 1946), p. 536, pl. 19, figs. 6, 7; text figs. 21–26. Upper Permian, Hydra Island, Greece.

Robulus adelinensis F. G. Keijzer, Thesis Univ. Utrecht, p. 193. Not figured. Oligo-Miocene, Cuba. For: *Cristellaria crassa* Palmer and Bermudez, 1936 (non d'Orbigny, 1846), Mem. Soc. Cubana Hist. Nat., vol. 10, p. 252, pl. 16, fig. 9.

——— ——— ——— var. *nipeensis* F. G. Keijzer, *ibid.*, p. 194, pl. 2, figs. 23, 24. Oligo-Miocene, Cuba.

——— *calcar* Linne (1758) subsp. *multispinata* Colom, Inst. Invest. Geol. "Lucas Mallada" Madrid, Estud. Geol. No. 3, p. 138, pl. 5, figs. 55, 57–59. Miocene (Vindobonian), Mallorca, Spain.

——— *coloratus* (Stache, 1865) subsp. *planularioides* Colom, *ibid.*, Estud. Geol. No. 3, p. 139, pl. 5, figs. 68, 71; pl. 6, figs. 72–78. Miocene (Vindobonian), Mallorca, Spain.

——— *formosus* (Cushman, 1923) var. *delicatus* Cushman and Todd, Cushman Lab. Foram. Res., Spec. Publ. 15, p. 13, pl., 2, fig. 7. Miocene, Jamaica.

——— *jamaicensis* Cushman and Todd, *ibid.*, Spec. Publ. 15, p. 14, pl. 2, fig. 10. Miocene, Jamaica. For: *Cristellaria helena* Nuttall, 1928 (non Karrer, 1877), Quart. Jour. Geol. Soc. London, vol. 84, p. 87, pl. 5, fig. 15.

Rotalia avonparkensis Applin and Jordan, Jour. Paleontology, vol. 19, p. 142, pl. 21, fig. 4. Late Middle Eocene, Florida.

——— *cushmani* Applin and Jordan, *ibid.*, vol. 19, p. 143. Not figured. Upper Eocene, Florida, For: *Rotalia sp.* Cushman, 1935, U. S. Geol. Surv. Prof. Pap. 181, p. 46, pl. 19, fig. 11.

ROTALIDEA superfam. nov. Glaessner, Principles of Micropalaeontology, p. 143. Comprises the following families: Spirillinidae Glaessner, 1945, *ut infra;* Discorbidae Glaessner, 1945, *ut supra;* Globigerinidae; Globorotaliidae; Gümbelinidae Glaessner, 1945, *ut supra;* Planorbulinidae; Cymbaloporidae; Nonionidae; Ceratobuliminidae; Amphisteginidae; Rotaliidae; Calcarinidae; Miogypsinidae; Orbitoididae; Discocyclinidae, and Camerinidae (*sive* Nummulitidae).

Saracenaria arcuata (d'Orbigny, 1846) var. *ampla* Cushman and Todd, Cushman Lab. Foram. Res., Spec. Publ. 15, p. 31, pl. 5, figs. 5, 6. Miocene, Jamaica. For: *Saracenaria italica* Cushman, 1929 (non Defrance, 1824), Contr. Cushman Lab. Foram. Res., vol. 5, p. 88, pl. 13, fig. 14.

——— *cushmani* Palmer, Bull. Amer. Paleontology, vol. 29, No. 115, p. 38, pl. 1, fig. 5. Miocene, Jamaica. (Note: The species-name is preoccupied by Tappan, 1940, Jour. Paleontology, vol. 14, p. 106, pl. 16, fig. 17, Lower Cretaceous, Texas.)

——— *latifrons* (Brady, 1884) var. *jamaicensis* Cushman and Todd, Cushman Lab. Foram. Res., Spec. Publ. 15, p. 32, pl. 5, fig. 7. Miocene, Jamaica.

——— *obesa* Cushman and Todd, *ibid.*, Spec. Publ. 15, p. 31, pl. 5, fig. 2. Miocene, Jamaica.

——— *palmerae* Cushman and Todd, *ibid.*, vol. 15, p. 30, pl. 5, fig. 1. Miocene, Jamaica.

Schenckiella suteri Cushman and Stainforth, *ibid.*, Spec. Publ. 14, p. 19, pl. 2, fig. 26. Upper Oligocene, Trinidad, B.W.I.

Seabrookia cretacea Pérébaskine, Bull. Soc. géol. France, (5) vol. 15 (published October 1946),

p. 358, pl. 4, figs. 3, 4. Upper Cretaceous, France. (Note: The specific name is preoccupied by *Seabrookia cretacica* Bermudez, 1938, Mem. Soc. Cubana Hist. Nat., vol. 12, p. 164, text figs. 1–3, Upper Cretaceous, Cuba.)

Spiphogaudryina see *Gaudryina*.

Siphogenerina paucicostata Cushman and Todd, Cushman Lab. Foram. Res., Spec. Publ. 15, p. 52, pl. 7, fig. 34. Miocene, Jamaica.

——— *texana* Cushman and Ellisor, Jour. Paleontology, vol. 19, p. 566, pl. 76, figs. 15, 16. Middle Oligocene, Texas.

Siphonina advena Cushman, 1922, var. *anahuacana* Cushman and Ellisor, *ibid.*, vol. 19, p. 569, pl. 77, fig. 9. Middle Oligocene, Texas.

——— *ornatissima* Colom, Inst. Invest. Geol. "Lucas Mallada" Madrid, Estud. Geol. No. 2, pl. 73, pl. 3, figs. 62, 63, 68. Lower Oligocene, Spain.

Siphotextularia miocenica Cushman and Todd, Cushman Lab. Foram. Res., Spec. Publ. 15, p. 4, pl. 1, fig. 9. Miocene, Jamaica.

Spirillina denticulogranulata Chapman, 1907, var. *pulchra* Parr, Proc. R. Soc. Victoria, vol. 56, pt. 2, p. 200, pl. 8, fig. 9; pl. 9, fig. 1. Recent, Australia.

—— *punctulata* (Terquem, 1870) var. *radians* Schmassmann, Tätigkeitsber. Naturforsch. Ges. Baselland, vol. 14, p. 163, text figs. 4 a–d. Jurassic (Bajocian), Jura Mountains, Switzerland.

SPIRILLINIDAE fam. nov. Glaessner, Principles of Micropaleontology, p. 144. New family of superfam. Rotaliidea Glaessner, 1945, *ut supra*. Comprises the subfamily Spirillininae with the genera *Spirillina*, *Archaediscus*, *Turrispirillina*, *Conicospirillina*, *Trocholina* and *Terebralina;* and the subfamily Patellininae with the genus *Patellina*.

Spiroloculina seminolensis Applin and Jordan, Jour. Paleontology, vol. 19, p. 137, pl. 18, fig. 11. Upper Eocene, Florida.

Stensiöina exsculpta (Reuss, 1850) var. *gracilis* Brotzen, Sverig. Geol. Undersökn., series C, No. 465, Arsbok 38, No. 7, p. 52, pl. 1, fig. 15. Santonian-Emscherian, Sweden.

Sulcoperculina see *Operculina*.

TABERINA gen. nov. F. G. Keijzer, Thesis Univ. Utrecht, p. 200. Family Peneroplidae; subfam. Rhapydionininae F. G. Keijzer, 1945, *ut supra*. Genotype: *Taberina cubana* F. G. Keijzer, 1945, *ut infra*. Upper Cretaceous to Paleocene (Danian to Montian). (Note: *cave Taberia* Paetel, 1875, Moll.)

——— *cubana* F. G. Keijzer, *ibid.*, p. 200, pl. 7, figs. 116–119. Danian-Montian, Cuba.

Textularia anahuacana Cushman and Ellisor, Jour. Paleontology, vol. 19, p. 546, pl. 71, fig. 7. Middle Oligocene, Texas.

——— *bermudezi* Cushman and Todd, Cushman Lab. Foram. Res., Spec. Publ. 15, p. 3, pl. 1, fig. 7. Miocene, Jamaica. For: *Textularia lythostrota* Lalicker and Bermudez, 1941 (non Schwager, 1866), Torreia, No. 8, p. 13, pl. 3, figs. 6, 7.

——— *cubensis* Lalicker and Bermudez, 1938, var. *nipeensis* F. G. Keijzer, Thesis Univ. Utrecht, p. 188, pl. 1, fig. 7. Oligo-Miocene, Cuba.

—— *deyaensis* Colom, Inst. Invest. Geol. "Lucas Mallada" Madrid, Estud. Geol. No. 2, p. 13, pl. 3, figs. 36–38. Miocene (Burdigalian), Mallorca, Spain.

——— *jarvisi* Cushman and Todd, Cushman Lab. Foram. Res., Spec. Publ. 15, p. 3, pl. 1, fig. 8. Miocene, Jamaica. For: *Textularia floridana* Cushman and Jarvis, 1930 (non Cushman, 1922), Jour. Paleontology, vol. 4, p. 354, pl. 32, fig. 2.

——— *seranensis* Valk, in Rutten and Hotz, Geol., Petrogr. and Paleont. Results Exped. Island Ceram, (3), Geol. No. 1, p. 20, pl. 2, figs. 5, 6. Plio-Pleistocene, Ceram.

Textulariella raadshooveni F. G. Keijzer, Thesis Univ. Utrecht, p. 190, pl. 2, fig. 22. Oligo-Miocene, Cuba.

THURAMMINOIDES gen. nov. Plummer, Univ. Texas Publ. 4401, p. 218. Fam. Saccamminidae; genotype: *Thuramminoides sphaeroidalis* Plummer, 1945, *ut infra*. Lower and lower Middle Pennsylvanian.

——— *sphaeroidalis* Plummer, *ibid.*, p. 218, pl. 15, figs. 4–10. Lower Middle Pennsylvanian, Texas.

TRANSVERSIGERINA subgen. nov. Mathews, Jour. Paleontology, vol. 19, p. 599. New subgenus of *Rectuvigerina* Mathews, 1945, *ut supra*. Fam. Uvigerinidae; subfam. Uvigerininae. Subgenotype: *Siphogenerina raphanus* (Parker and Jones, 1865) var. *transversa* Cushman, 1918, U. S. Nat. Mus., Bull. vol. 103, p. 64, pl. 22, fig. 8. Upper Oligocene to Miocene.

TRICARINELLA gen. nov. ten Dam and Schijfsma, Comptes Rendus Soc. géol. France, p. 233. Fam. Lagenidae. Genotype: *Rhabdogonium excavatum* Reuss, 1862 (1863), Sitzber. k. Akad. Wiss. Wien, math.-naturw. Cl., vol. 46, p. 91, pl. 12, fig. 8. Upper Jurassic, Cretaceous, and Lower Tertiary. (Note: This new genus is a synonym of *Tristix* Macfadyen, 1941.)

Triloculina bassensis Parr, Proc. R. Soc., Victoria, vol. 56, pt. 2, p. 198, pl. 8, fig. 7. Recent, Australia.

Tritaxilina balearica Colom, Inst. Invest. Geol. "Lucas Mallada" Madrid, Estud. Geol. No. 2, p. 31, pl. 10, figs. 146, 147; pl. 11, figs. 148–150. Miocene (Burdigalian), Mallorca, Spain.

TSCHOPPINA gen. nov. F. G. Keijzer, Thesis Univ. Utrecht, p. 213. Fam. Cymbaloporidae. Genotype: *Pseudorbitolina cubensis* Cushman and Bermudez, 1936, Contr. Cushman Lab. Foram. Res., vol. 12, p. 59, pl. 10, figs. 27–30. Eocene. (Note: This new genus is invalid because it is based on the same genotype as *Eodictyoconus* Cole and Bermudez, 1944, Bull. Amer. Paleontology, vol. 28, No. 113, p. 6, of the family Valvulinidae. *Tschoppina* F. G. Keijzer becomes, therefore, a synonym of *Eodictyoconus* Cole and Bermudez. Keijzer's thesis appeared in print on or about October 1, 1945, shortly after the termination of the war in Europe. He had, apparently, no knowledge of the publication by Cole and Bermudez.)

——— *cubensis* (Cushman and Bermudez, 1936)

var. *pustulosa* F. G. Keijzer, *ibid.*, p. 214. Not figured, only described. Eocene, Cuba.

Uvigerina charltonae Palmer, Bull. Amer. Paleontology, vol. 29, No. 115, p. 49, pl. 1, fig. 3. Middle Miocene, Jamaica.

——— *ciperana* Cushman and Stainforth, Cushman Lab. Foram. Res., Spec. Publ. 14, p. 49, pl. 7, figs. 19, 20. Lower Oligocene, Trinidad, B.W.I.

——— *finelineata* F. G. Keijzer, Thesis Univ. Utrecht, p. 202, pl. 3, fig. 47. Oligo-Miocene, Cuba.

——— *hispido-costata* Cushman and Todd, Cushman Lab. Foram. Res., Spec. Publ. 15, p. 51, pl. 7, figs. 27, 31. Miocene, Jamaica. For: *Uvigerina peregrina* Cushman var. *parvula* Cushman and Jarvis, 1930 (non Cushman, 1923), Jour. Paleontology, vol. 4, p. 363, pl. 33, fig. 11; for: *U. peregrina* Coryell and Rivero, 1940, Jour. Paleontology, vol. 14, p. 343, pl. 44, fig. 19 (non Cushman, 1923); for: *U. peregrina* Cushman and Todd 1941, *pro parte* (non Cushman, 1923), Contr. Cushman Lab. Foram. Res., vol. 17, p. 51, pl. 14, figs. 14, 15 (nec 16, 17); for: *U. pigmea* Coryell and Rivero, 1940 (non d'Orbigny, 1826), Jour. Paleontology, vol. 14, p. 343, pl. 44, fig. 20; for: *U. garderae* (read *gardnerae*) Galloway and Heminway, 1941 (non Cushman, 1926), New York Acad. Sci., Sci. Surv. Porto Rico and Virgin Island, vol. 3, pt. 4, p. 429, pl. 33, fig. 13; and for *U. gallowayi* Coryell and Rivero, 1940 (non Cushman, 1929), Jour. Paleontology, vol. 14, p. 244, pl. 36, fig. 50.

——— *nipeensis* F. G. Keijzer, Thesis Univ. Utrecht, p. 202, pl. 3, fig. 48. Oligo-Miocene, Cuba.

——— *pigmea* d'Orbigny, 1826, var. *caribbeana* F. G. Keijzer, *ibid.*, p. 202, pl. 3, fig. 46. Oligo-Miocene, Cuba. For: "Such small forms as figured by Cushman and Nuttall (see Contr. Cushman Lab. Foram. Res., vol. 14, 1938, p. 89, pl. 14, figs. 13, 14)."

Vaginulina bassensis Parr, Proc. R. Soc. Victoria, vol. 56, pt. 2, p. 200, pl. 12, fig. 4. Recent, Australia.

Vaginulinopsis vindoboniensis Colom, Inst. Invest. Geol. "Lucas Mallada" Madrid, Estud. Geol. No. 3, p. 149, pl. 12, figs. 250–254. Miocene (Vindobonian), Mallorca, Spain.

Valvulammina minuta Applin and Jordan, Jour. Paleontology, vol. 19, p. 135, pl. 18, fig. 6. Late Middle Eocene, Florida.

——— *nassauensis* Applin and Jordan, *ibid.*, vol. 19, p. 135, pl. 18, fig. 7. Paleocene, Florida.

——— *plana* F. G. Keijzer, Thesis Univ. Utrecht, p. 190, pl. 5, fig. 65. Upper Eocene, Cuba.

Valvulina avonparkensis Applin and Jordan, Jour. Paleontology, vol. 19, p. 134, pl. 18, fig. 3. Late Middle Eocene, Florida.

——— *intermedia* Applin and Jordan, *ibid.*, vol. 19, p. 134, pl. 18, fig. 4. Late Middle Eocene, Florida.

Valvulineria crassisepta F. G. Keijzer, Thesis Univ. Utrecht, p. 203, pl. 4, fig. 56. Oligo-Miocene, Cuba.

——— *georgiana* Cushman, 1935, var. *compacta* Cushman, Contr. Cushman Lab. Foram. Res., vol. 21, p. 9, pl. 2, fig. 10. Upper Eocene, Georgia.

——— *jacksonensis* Cushman, 1933, var. *dentata* Cushman, *ibid.*, vol. 21, p. 9, pl. 2, fig. 11. Upper Eocene, Georgia.

——— *palmerae* Cushman and Todd, Cushman Lab. Foram. Res., Spec. Publ. 15, p. 56, pl. 8, fig. 18. Miocene, Jamaica. For: *Valvulineria araucana* Palmer 1941 (non d'Orbigny, 1839), Mem. Soc. Cubana Hist. Nat., vol. 15, p. 191, pl. 15, figs. 15–17.

Verneuilina carinata Hermes, Thesis Univ. Utrecht, p. 32, pl. 4, figs. 1, 2. Upper Eocene, Cuba.

——— *nuevitasensis* Hermes, *ibid.*, p. 32, pl. 4, fig. 3. Upper Eocene, Cuba.

Virgulina ciperana Cushman and Stainforth, Cushman Lab. Foram. Res., Spec. Publ. 14, p. 46, pl. 7, fig. 10. Middle Oligocene, Trinidad, B.W.I.

——— *keijzeri* Hermes, Thesis Univ. Utrecht, p. 33, pl. 4, fig. 10. Upper Eocene, Cuba. For: *Virgulina sp.* F. G. Keijzer, 1945, *ut infra*. (See list of *nomenclatura aperta* for 1945.)

——— *minutissima* Cushman, Contr. Cushman Lab. Foram. Res., vol. 21, p. 8, pl. 2, fig. 7. Upper Eocene, Georgia.

Vulvulina guppyi Cushman and Stainforth, Cushman Lab. Foram. Res., Spec. Publ. 14, p. 16, pl. 1, figs. 21, 22. Upper Oligocene, Trinidad, B.W.I.

Webbinella bassensis Parr, Proc. R. Soc. Victoria, vol. 56, pt. 2, p. 193, pl. 8, fig. 3. Recent, Australia.

Wedekindellina matura Thompson, State Geol. Surv. Kansas, Bull. 60, p. 56, pl. 4, figs. 1–12; pl. 5, fig. 5. Pennsylvanian, Colorado.

FORMS WITH NOMENCLATURA APERTA

Ammobaculites sp. Wirz, Schweiz. Palaeont. Abhandl., vol. 65, p. 43, pl. 74, figs. 12–14. Triassic (Ladinian), Southern Switzerland.

Ammodiscus sp. Wirz, *ibid.*, vol. 65, p. 41, pl. 74, figs. 1, 2. Triassic (Ladinian), Southern Switzerland.

? Anomalina sp. Hermes, Thesis Univ. Utrecht, p. 35, pl. 4, fig. 15. Upper Eocene, Cuba.

? Archaias sp. F. G. Keijzer, Thesis Univ. Utrecht, p. 201, pl. 11, fig. 3 (note: not figs. 1 and 2). Lower or Middle Eocene, Cuba.

Asterocyclina sp. F. G. Keijzer, *ibid.*, p. 215, text fig. 34. Probably Lower Eocene, Cuba.

Barbourinella sp. F. G. Keijzer, *ibid.*, p. 189, pl. 1, fig. 10. Oligo-Miocene, Cuba.

Bolivina sp. F. G. Keijzer, *ibid.*, p. 201, pl. 3, fig. 45. Lower Oligocene, Cuba.

Cancris sp. Parr, Proc. R. Soc. Victoria, vol. 56, p. 213, pl. 11, fig. 7. Recent, Australia.

Cibicides sp. Hermes, Thesis Univ. Utrecht, p. 35, pl. 5, fig. 2. Upper Eocene, Cuba.

——— *sp.* Keijzer, Thesis Univ. Utrecht, p. 208, pl. 5, fig. 76. Oligo-Miocene, Cuba.

?? Cymbalopora sp. Valk, in Rutten and Hotz, Geol., Petrogr. and Palaeont. Results Exped.

Island Ceram, (3), Geol. No. 1, p. 19, pl. 1, fig. 3. Upper Triassic, Ceram.

Cymbaloporetta sp. F. G. Keijzer, Thesis Univ. Utrecht, p. 204, pl. 4, fig. 57. Oligo-Miocene, Cuba.

? Darbyella sp. F. G. Keijzer, *ibid.*, p. 194, pl. 2, fig. 26. Oligo-Miocene, Cuba.

Dentalina sp. Cushman and Todd, Contr. Cushman Lab. Foram. Res., vol. 21, p. 13, pl. 3, figs. 13, 14. Eocene, Albama.

——— *sp.* Wirz, Schweiz. Palaeont. Abhandl., vol. 65, p. 45, pl. 74, fig. 29. Triassic, Switzerland.

—— *sp.* Wirz, *ibid.*, vol. 65, p. 45, pl. 74, fig. 34. Triassic, Switzerland.

——— *sp.* Wirz, *ibid.*, vol. 65, p. 45, pl. 74. figs. 30, 31. Triassic, Switzerland.

——— *sp.* Wirz, *ibid.*, vol. 65, text figs. 5a–e. Triassic, Switzerland.

——— *sp.* Wirz, *ibid.*, vol. 65, p. 45, pl. 74, figs. 32, 33. Triassic, Switzerland.

——— *sp. A* Cushman and Todd, Cushman Lab. Foram. Res., Spec. Publ. 15, p. 23, pl. 3, fig. 23. Miocene, Jamaica.

——— *sp. A* Cushman and Todd, Contr. Cushman Lab. Foram. Res., vol. 21, p. 86, pl. 14, fig. 4. Upper Eocene, Mississippi.

——— *sp. B* Cushman and Todd, *ibid.*, vol. 21, p. 87, pl. 14, fig. 5. Upper Eocene, Mississippi.

——— *sp. B* Cushman and Todd, Cushman Lab. Foram. Res., Spec. Publ. 15, p. 23, pl. 3, fig. 24. Miocene, Jamaica.

——— *sp. C* Cushman and Todd, *ibid.*, Spec. Publ. 15, p. 23, pl. 3, fig. 16. Miocene, Jamaica.

? Dentalina sp. F. G. Keijzer, Thesis Univ. Utrecht, p. 198, pl. 5, fig. 75. Oligo-Miocene, Cuba.

Discocyclina sp. F. G. Keijzer, *ibid.*, p. 215, pl. 6, fig. 79, ? 82. Danian-Montian, Cuba.

——— *sp. sp.* Hermes, Thesis Univ. Utrecht, p. 27, pl. 2, fig. 4–12. Upper or Middle Eocene, Cuba.

? Discocyclina sp. Valk, in Rutten and Hotz. Geol., Petrogr. and Palaeont. Results Exped. Island Ceram, (3), Geol. No. 1, p. 17, pl. 2, fig. 1. Found reworked in a conglomerate; Eocene, Ceram.

Discocyclina (*Asterocyclina*) *sp.* Vaughan, Geol. Soc. America, Mem. 9, p. 43, pl. 15, fig. 6. Middle Eocene, Barbados.

Discorbis sp. Cushman and Ellisor, Jour. Paleontology, vol. 19, p. 568, pl. 77, fig. 3. Middle Oligocene, Texas.

? Discorbis oder Jugendstadium von Planorbulina Bitterli, Beitr. geol. Karte Schweiz, new series, vol. 81, p. 30, text fig. 12. Nrs. 5, 6, 15, 16. Oligocene (Rupelian), Jura Mountains, Switzerland.

Eggerella sp. Parr, Proc. R. Soc. Victoria, vol. 56, p. 195, pl. 8, fig. 5. Recent, Australia.

Ellipsolagena sp. Cushman and Stainforth, Cushman Lab. Foram. Res., Spec. Publ. 14, p. 59, pl. 10, fig. 15. Upper Oligocene, Trinidad.

Ellipsonodosaria sp. Cushman, Contr. Cushman Lab. Foram. Res., vol. 21, p. 9, pl. 2, fig. 8. Upper Eocene, Georgia.

——— *sp.* Hermes, Thesis Univ. Utrecht, p. 34, pl. 4, fig. 9. Upper Eocene, Cuba.

——— (*?*) *sp. A* Cushman and Todd, Cushman Lab. Foram. Res., Spec. Publ. 15, p. 56, pl. 8, fig. 14. Miocene, Jamaica.

Elphidium sp. F. G. Keijzer, Thesis Univ. Utrecht, p. 200, pl. 3, fig. 44. Probably Miocene, Cuba.

Eponides sp. Bitterli, Beitr. geol. Karte Schweiz, new series, vol. 81, p. 30, text fig. 12 Nr. 4. Oligocene (Rupelian), Jura Mountains Switzerland.

Fusulina form *A* Thompson, State Geol. Surv. Kansas, Bull. 60, p. 65, pl. 6, figs. 1–9. Pennsylvanian, Utah.

——— form *B* Thompson, *ibid.*, Bull. 60, p. 65, pl. 6, figs. 17, 18, 22, 23. Pennsylvanian, Utah.

——— form *C* Thompson, *ibid.*, p. 65, pl. 6, figs. 19–21. Pennsylvanian, Utah.

——— form *D* Thompson, *ibid.*, Bull. 60, p. 65, pl. 6, figs. 24–31. Pennsylvanian, Utah.

Fusulinella ? sp. indet. Toriyama, Japan. Jour. Geol. and Geogr., vol. 20, p. 7, pl. 1, fig. 19. Carboniferous, Japan.

Gaudryina sp. F. G. Keijzer, Thesis Univ. Utrecht, p. 189, pl. 1, fig. 11. Oligo-Miocene, Cuba.

Gaudryinella sp. Valk, in Rutten and Hotz, Geol., Petrogr. and Palaeont. Results Explor. Island Ceram, (3), Geol. No. 1, p. 20, pl. 2, fig. 7. Plio-Pleistocene, Ceram.

Globigerina sp. Bitterli, Beitr. geol. Karte Schweiz, new series, vol. 81, p. 30, text fig. 12 Nrs. 7, 8. Oligocene (Rupelian), Swiss Jura Mountains.

Globulina sp. Cushman and Todd, Contr. Cushman Lab. Foram. Res., vol. 21, p. 14, pl. 3, fig. 23. Eocene, Alabama.

Glomospira sp. Wirz, Schweiz. Palaeont. Abhandl. vol. 65, p. 42, pl. 74, figs. 3–9. Triassic (Ladinian), South Switzerland.

Haplophragmoides sp. Cushman and Ellisor. Jour. Paleontology, vol. 19, p. 546, pl. 71, fig. 5. Middle Oligocene, Texas.

——— *sp.* Cushman and Todd, Contr. Cushman Lab. Foram. Res., vol. 21, p. 11, pl. 3, fig. 2. Eocene, Alabama.

Helicostegina sp. F. G. Keijzer, Thesis Univ. Utrecht, p. 214, pl. 7, figs. 120–123. Middle to Upper Eocene, Cuba.

Karreriella sp. Valk, in Rutten and Hotz, Geol., Petrogr. and Palaeont. Res. Exped. Island Ceram (3), Geol. No. 1, p. 20, pl. 2, fig. 8. Plio-Pleistocene, Ceram.

——— *sp. I* F. G. Keijzer, Thesis Univ. Utrecht p. 191, pl. 2, fig. 17. Lower Oligocene, Cuba.

——— *sp. II* F. G. Keijzer, *ibid.*, p. 192, pl. 2 fig. 18. Upper Eocene, Cuba.

Lagena sp. A Cushman and Todd, Cushman Lab. Foram. Res., Spec. Publ. 15, p. 34, pl. 5, fig. 18. Miocene, Jamaica.

——— *sp. I* F. G. Keijzer, Thesis Univ. Utrecht, p. 198, pl. 3, fig. 37. Upper Eocene, Cuba.

——— *sp. II* F. G. Keijzer, *ibid.*, p. 198, pl. 3, fig. 40. Upper Eocene, Cuba.

——— *sp. III* F. G. Keijzer, *ibid.*, p. 199, pl. 3, fig. 38. Upper Eocene, Cuba.

Lagenidae sp. Wirz, Schweiz. Palaeont. Abhandl. vol. 65, p. 45, pl. 74, fig. 28. Triassic, Ladinian, Southern Switzerland.

Lepidocyclina sp. Cole. B. P. Bishop Museum Bull. 181, p. 296, pl. 23, figs. G. H. Lower Miocene, Lau, Fiji.

——— *sp.* Cole, Florida State Geol. Surv. Bull. 28, p. 45, pl. 8, fig. 13. Oligocene, Florida.

——— (*Pliolepidina*) *sp.* Vaughan, Geol. Soc. America, Mem. 9, p. 50, pl. 19, fig. 10. Middle Miocene, Barbados.

Lingulina sp. F. G. Keijzer, Thesis Univ. Utrecht, p. 196, pl. 5, fig. 72. Oligo-Miocene, Cuba.

Lituolidae sp. Wirz, Schweiz. Palaeont. Abhandl. vol. 65, p. 43, pl. 74, fig. 15. Triassic, Ladinian, Southern Switzerland.

Loxostomum sp. Hermes, Thesis Univ. Utrecht, p. 34, pl. 4, fig. 8. Upper Eocene, Cuba.

Marginulina sp. Hermes, *ibid.*, p. 33, pl. 4 ,fig. 7. Upper Eocene, Cuba.

——— *sp. A* Cushman and Todd, Cushman Lab. Foram. Res., Spec. Publ. 15, p. 20, pl. 3, fig. 12. Miocene, Jamaica.

——— *sp. I* F. G. Keijzer, Thesis Univ. Utrecht, p. 197, pl. 5, fig. 73. Oligo-Miocene, Cuba.

——— *sp. II* F. G. Keijzer, *ibid.*, p. 197, pl. 3, fig. 33. Oligo-Miocene, Cuba.

——— *sp. indet.* Valk, in Rutten and Hotz, Geol. Petrogr. and Palaeont. Res. Exped. Island Ceram, (3), Geol. No. 1, p. 21, pl. 2, fig. 11. Plio-Pleistocene, Ceram.

Millerella sp. A Thompson, State Geol. Surv. Kansas, Bull. 60, p. 48, pl. 1, figs. 12–14. Pennsylvanian, Colorado.

Miscellanea sp. indet. Vaughan, Geol. Soc. America, Mem. 9, p. 29, pl. 4, figs. 3–5; pl. 5, fig. 1. Paleocene, Barbados.

Nodobaculariella sp. Cushman and Todd, Contr. Cushman Lab. Foram. Res., vol. 21, p. 84, pl. 13, figs. 21, 22. Upper Eocene, Mississippi.

Nodosaria sp. F. G. Keijzer, Thesis Univ. Utrecht, p. 198, pl. 3, fig. 31. Oligo-Miocene, Cuba.

——— (*?*) *sp. A* Cushman and Todd, Cushman Lab. Foram. Res., Spec. Publ. 15, p. 29, pl. 4, fig. 23. Miocene, Jamaica.

? Nodosaria sp. Valk, in Rutten and Hotz, Geol., Petrogr. and Palaeont. Res. Exped. Island Ceram, (3), Geol. No. 1, p. 19, pl. 1, fig. 2. Reworked from an Upper Triassic limestone, Ceram.

? ——— *sp.* Valk, *ibid.*, p. 19, pl. 1, fig. 1. From a boulder in Triassic graywacke, Ceram.

? ——— *sp.* Valk, *ibid.*, p. 19, pl. 1, fig. 4. From a limestone of Upper Triassic age, Ceram.

? ——— *sp. I* F. G. Keijzer, Thesis Univ., Utrecht, p. 198, pl. 3, fig. 36. Upper Eocene, Cuba.

? ——— *sp. II* F. G. Keijzer, *ibid.*, p. 198, pl. 3, fig. 34. Oligo-Miocene, Cuba.

Nodosaridae sp. Wirz, Schweiz. Palaeont. Abhandl., vol. 65, p. 45, pl. 74, fig. 35. Triassic, Ladinian, Southern Switzerland.

Nonion sp. F. G. Keijzer, Thesis Univ. Utrecht, p. 199, pl. 3, fig. 43. Probably Middle Miocene, Cuba.

Nubeculinella sp. Wirz, Schweiz. Palaeont. Abhandl, vol. 65, p. 44, pl. 74, fig. 22. Triassic, Ladinian, Southern Switzerland.

Ophthalmidiidae sp. sp. Wirz, *ibid.*, vol. 65, p. 44, pl. 74, figs. 20, 21. Triassic, Ladinian, Southern Switzerland.

Ophthalmidium sp. Schmassmann, Tätigkeitsber. Naturforsch. Ges. Baselland, vol. 14, p. 50, text fig. 3. Jurassic, Bajocian, Swiss Jura Mountains.

Planularia sp. Cushman and Todd, Contr. Cushman Lab. Foram. Res., vol. 21, p. 85, pl. 13, fig. 28. Upper Eocene, Mississippi.

——— *sp.* F. G. Keijzer, Thesis Univ. Utrecht, p. 195, pl. 5, fig. 70. Oligo-Miocene, Cuba.

? ——— *sp.* F. G. Keijzer, *ibid.*, p. 195, pl. 3, fig. 32. Oligo-Miocene, Cuba.

——— *sp. indet.* Valk, in Rutten and Hotz, Geol., Petrogr. and Palaeont. Res. Exped. Island Ceram, (3), Geol. No. 1, p. 21, pl. 2, fig. 12. Plio-Pleistocene, Ceram.

Planulina sp. Colom. Inst. Invest. Geol. "Lucas Mallada" Madrid, Estud. Geol. No. 2, p. 84, pl. 7, figs. 187, 188. Lower Oligocene, Spain.

Planorbulina sp. Bitterli, Beitr. geol. Karte Schweiz, new series, vol. 81, p. 30, text fig. 12, Nrs. 9–14. Oligocene, Rupelian, Swiss Jura Mountains.

Plectina sp. F. G. Keijzer, Thesis Univ. Utrecht, p. 191, pl. 2, fig. 15. Upper Eocene, Cuba.

? Plectofrondicularia sp. Hermes, Thesis Univ. Utrecht, p. 33, pl. 4, fig. 11. Upper Eocene, Cuba.

Polymorphina sp. Cushman, Contr. Cushman Lab. Foram. Res., vol. 21, p. 5, pl. 1, fig. 14. Upper Eocene, Georgia.

Pseudoglandulina sp. indet. Valk, in Rutten and Hotz, Geol., Petrogr. and Paleont. Res. Exped. Island Ceram, (3), Geol. No. 1, p. 22, pl. 2, fig. 4. Plio-Pleistocene, Ceram.

Pseudophragmina (*Proporocyclina*) *sp.* Vaughan, Geol. Soc. America, Mem. 9, p. 100, pl. 44, fig. 1. Paleocene, Mexico.

——— (———) *sp.* Vaughan, *ibid.*, Mem. 9, p. 46, pl. 15, figs. 7, 7a. Middle Eocene, Barbados.

Quinqueloculina sp. Bitterli, Beitr. geol. Karte Schweiz, new series, vol. 81, p. 30, text fig. 12 Nr. 1. Oligocene, Swiss Jura Mountains.

——— *sp.* Bitterli, *ibid.*, vol. 81, p. 30, text fig. 12, Nr. 2. Oligocene, Swiss Jura Mountains.

——— *sp.* Bitterli, *ibid.*, vol. 81, p. 30, text fig. 12 Nr. 3. Oligocene, Swiss Jura Mountains.

——— *sp.* Valk, in Rutten and Hotz, Geol., Petrogr. and Palaeont. Res. Exped. Island Ceram, (3), Geol. No. 1, p. 19, pl. 1, fig. 5. From a limestone of Upper Triassic age, Ceram.

Rhapydionina sp. F. G. Keijzer, Thesis Univ. Utrecht, p. 201, pl. 11, fig. 9. Lower or Middle Eocene, Cuba.

Robuloides sp. indet. Reichel, Eclog. geol. Helv., vol. 38 (published June 1946), p. 539, text fig. 18. Upper Permian, Greece.

Robulus sp. Colom, Inst. Invest. Geol. "Lucas Mallada" Madrid, Estud. Geol. No. 2, p. 82, pl. 2, fig. 41. Lower Oligocene, Spain.

——— *sp. A* Cushman and Todd, Cushman Lab. Foram. Res., Spec. Publ. 15, p. 17, pl. 2, fig. 16. Miocene, Jamaica.

——— *sp. B* Cushman and Todd, *ibid.*, Spec. Publ. 15, p. 17, pl. 2, fig. 17. Miocene, Jamaica.

——— *sp. I* F. G. Keijzer, Thesis Univ. Utrecht, p. 194, pl. 2, fig. 25. Oligo-Miocene, Cuba.

——— *sp. II* F. G. Keijzer, *ibid.*, p. 194, pl. 2, fig. 28. Oligo-Miocene, Cuba.

? Rotalia sp. Valk, in Rutten and Hotz, Geol., Petrogr. and Palaeont. Res. Exped. Island Ceram, (3), Geol. No. 1, p. 19, pl. 1, fig. 6. From a limestone of Upper Triassic age, Ceram.

Saracenaria sp. Cushman and Stainforth, Cushman Lab. Foram. Res., Spec. Publ. 14, p. 27, pl. 4, fig. 6. Middle Oligocene, Trinidad.

——— *sp. A* Cushman and Todd, *ibid.*, Spec. Publ. 15, p. 32, pl. 5, fig. 3. Miocene, Jamaica.

Siphogenerina sp. F. G. Keijzer, Thesis Univ. Utrecht, p. 203, pl. 3, fig. 51. Oligo-Miocene, Cuba.

Spiroplectammina sp. Wirz, Schweiz. Palaeont. Abhandl., vol. 65, p. 43, pl. 74, fig. 19. Triassic, Southern Switzerland

——— *? sp.* Cushman, Proc. Amer. Philos. Soc., vol. 89, No. 1, p. 287, pl. fig. 9. Recent, Antarctic.

Textulariella sp. Cushman and Ellisor, Jour. Paleontology, vol. 19, p. 548, pl. 71, fig. 14. Middle Oligocene, Texas.

Textulariidae sp. sp. Wirz, Schweiz. Palaeont. Abhandl., vol. 65, p. 43, pl. 74, figs. 16–18. Triassic, Switzerland.

? Tritaxilina sp. F. G. Keijzer, Thesis Univ. Utrecht, p. 192, pl. 2, fig. 19. Oligo-Miocene, Cuba.

Trochammina sp. Wirz, Schweiz. Palaeont. Abhandl., vol. 65, p. 44, pl. 74, fig. 23. Triassic, Switzerland.

——— *sp.* Wirz, *ibid.*, vol. 65, p. 44, pl. 74, fig. 24. Triassic, Switzerland.

——— *sp.* Wirz, *ibid.*, vol. 65, p. 44, pl. 74, fig. 25. Triassic, Switzerland.

——— *sp.* Wirz, *ibid.*, vol. 65, p. 44, pl. 74, figs. 26, 27. Triassic, Switzerland.

Turritellella sp. Wirz, *ibid.*, vol. 65, p. 43, pl. 74, figs. 10, 11. Triassic, Switzerland.

Valvulineria sp. F. G. Keijzer, Thesis Univ. Utrecht, p. 203, pl. 4, fig. 54. Oligo-Miocene Cuba.

? Verneuilina sp. F. G. Keijzer, *ibid.*, p. 189, pl. 1, fig. 8. Upper Eocene, Cuba.

Virgulina sp. F. G. Keijzer, *ibid.*, p. 201, pl. 3, fig. 50. Upper Eocene, Cuba. (Note: This species has been named *Virgulina keijzeri* by Hermes, 1945, *ut supra.*)

NOMINA NUDA

The following *nomina nuda* were observed in the literature of the year 1945:

Bolivina seranensis Germeraad, in Valk, Rutten and Hotz, Geol., Petrogr. and Paleont. Res. Exped. Island Ceram, (3), Geol. No. 1, p. 24.

Laffitteina, the new genus listed above, with two species, *L. libensis* and *L. monodi* is listed as *nomen nudum* in Marie, 1945, Comptes Rendus Soc. géol. France, p. 150.

In the paper by Suleimanov, 1945, Comptes rendus (Doklady) Acad. Sci. U.R.S.S., vol. 48, No. 2, the following *nomina nuda* are mentioned: *Bathysiphon bashkiricus* sp. nov. *Endothyra glomiformis* Lip., and *Spiroplectammina chernyshinensis* Lip.

The last two named species have probably been published in the Russian literature, which, unfortunately, is not available to the writer. This remark refers also to the rest of papers on foraminifera published in the Soviet Union during the last seven years.

SUPPLEMENT TO INDEX FOR 1939

BRUNSIA, gen. nov. Mikhailov, a new genus of the fam. Ammodiscidae. Genotype: *Brunsia pulchra* Mikhailov, 1939, *ut infra.* (Note: The original publication of Mikhailov was not available to the compiler. The genus and its genotype, however, are cited in Tchernysheva, 1940, Bull. Soc. Natural. Moscou, vol. 48, sect. géol., vol. 18, p. 124.) Carboniferous, Soviet Russia.

——— *pulchra* Mihkailov (original publication not seen; Re-figured in Tchernysheva, 1940, Bull. Soc. Natural, Moscou, vol. 48, sect. géol., vol. 18, p. 124, pl. 2, fig. 5). Carboniferous, Soviet Russia.

Colaniella gen. nov. Licharew, The Atlas of the Leading Forms of the Fossil Fauna URSS., vol. 6, Permian, Centr. Geol. and Prosp. Inst. Leningrad, p. 31. For: *Pyramis* Colani, 1924, (non *Pyramis* Bolten, 1798; non Schumacher, 1817; non Otto, 1821; non Brown, 1827; non Coutony, 1839; non Putzeys, 1846; non Haeckel, 1887). Fam. Nodosinellidae Rhumbler. Genotype: *Pyramis parva* Colani, 1924 Mém. Serv. géol. Indochine, vol. 11, fasc. 1, p. 181, pl. 29, figs. 2, 4–17, 19, 21, 24. Permian.

Cristellaria hatangensis Mjatliuk, Trans. Arctic Inst. Leningrad, vol. 126 (original publication not seen). Jurassic, Soviet Russia (Nordvick, Khatang Bay).

——— *nordvikensis* Mjatliuk, *ibid.*, vol. 126 (original publication not seen). Jurassic, Nordvick, Khatang-Bay, Soviet Russia.

Marginulina nordvikensis Mjatliuk, *ibid.*, vol. 162 (original publication not seen). Jurassic, Nordvick, Khatang-Bay, Soviet Russia.

Trochammina praesquamata Mjatliuk, Trans. Arctic. Inst. Leningrad. vol. 126 (original publication not seen). Jurassic, Nordvick, Khatang-Bay, Soviet Russia.

Verneuilina sibirica Mjatliuk, *ibid.*, vol. 126 (original publication not seen). Jurassic, Nordvick, Khatang-Bay, Soviet Russia.

SUPPLEMENT TO INDEX FOR 1940

In Journal of Paleontology, vol. 17, No. 4, July 1943, pp. 407–08 a list of new Foraminifera has been given which were erected, during 1940, by Buchner and by Wanner. The exact bibliographic references, which could not be furnished at that time, are here supplemented, as follows:

CADOSINA gen. nov. Wanner, Palaeont. Zeitschr., vol. 22, p. 79. Fam. Cadosinidae Wanner, 1940, *ut infra.* Genotype: *Cadosina fusca* Wanner, 1940, *ut infra.* Upper Jurassic and Lower Cretaceous.

——— *fusca* Wanner, *ibid.*, vol. 22, p. 79, text figs. 19–30. Upper Jurassic (Malm), and Lower

Cretaceous (Neocomian), Eastern East-Indian Archipelago.

——— *semiradiata* Wanner, *ibid.*, vol. 22, p. 81, text figs. 36, 37. Malm and Neocomian, Eastern East-Indian Archipelago.

CADOSINIDAE fam. nov. Wanner, *ibid.*, vol. 22, p. 91, with genus *Cadosina* Wanner, 1940, *ut supra*. Upper Jurassic and Lower Cretaceous (Malm and Neocomian).

CRIBROROBULINA gen. nov. Selli, Giorn. Geol. Bologna, vol. 14, p. 91. Fam. Lagenidae. Genotype: *Robulina serpens* Seguenza, 1880, Mem. R. Accad. Lincei, (3), vol. 6, p. 143, pl. 12, fig. 25. Oligocene to Recent.

——— *serpens* (Seguenza, 1880) var. *subcarenata* Selli, *ibid.*, vol. 14, p. 88, pl. 1 (not pl. 3), fig. 11. Lower Pliocene, Italy.

Endothyra communis Rauser, in Tchernysheva, Bull. Soc. Natural. Moscou, vol. 48, sect. géol. vol. 18, p. 124, pl. 1, fig. 5; pl. 2, fig. 7. Lower Carboniferous, South Urals region, Soviet Russia.

——— *primaeva* Rauser, in Tchernysheva, *ibid.*, vol. 48, sect. géol. vol. 18, p. 125, pl. 2, fig. 8. Lower Carboniferous, South Urals region, Soviet Russia.

——— *rjausakensis* Tchernysheva, *ibid.*, vol. 48, sect. géol. vol. 18, p. 127. Onomatype. Lower Carboniferous, South Urals region, Soviet Russia.

——— *spinosa* Tchernysheva, *ibid.*, vol. 48, sect. géol. vol. 18, p. 126, pl. 2, fig. 12. Lower Carboniferous, South Urals regions, Soviet Russia.

Lagena aequilabialis Buchner, Nova Acta Leopold., New Series, vol. 9, No. 62, p. 513, pl. 22, figs. 440–444. Subfossil and Recent, Island Ischia, Italy.

——— *aequilibrata* Buchner, *ibid.*, vol. 9, No. 62, p. 498, pl. 18, figs. 378–380. Subfossil, Island Ischia, Italy.

——— *ampullacea* Buchner, *ibid.*, vol. 9, No. 62, p. 493, pl. 17, figs. 346–348. Subfossil and Recent, Island Ischia, Italy.

——— *arata* Buchner, *ibid.*, vol. 9, No. 62, p. 532, pl. 26, figs. 562–565. Subfossil, Island Ischia, Recent, Sicily, Italy.

——— *arquata* Buchner, *ibid.*, vol. 9, No. 62, p. 427; pl. 3, fig. 47. Subfossil, Island Ischia; Recent, Ischia and Sicily, Italy.

——— *artificiosa* Buchner, *ibid.*, vol. 9, No. 62, p. 430, pl. 4, figs. 65–67. Subfossil and Recent, Island Ischia, Italy.

——— *aureoligera* Buchner, *ibid.*, vol. 9, No. 62, p. 457, pl. 9, figs. 144, 145. Subfossil, Island Ischia, Italy.

——— *aurifera* Buchner, *ibid.*, vol. 9, No. 62, p. 497, pl. 18, figs. 365–368. Subfossil and Recent, Island Ischia; Recent Sicily, Italy.

——— ——— ——— var. *connectens* Buchner, *ibid.*, vol. 9, No. 62, p. 498, pl. 18, figs. 362–364. Subfossil, Island Ischia, Italy.

——— *benevestita* Buchner, *ibid.*, vol. 9, No. 62, p. 445, pl. 7, fig. 101. Subfossil and Recent, Island Ischia, Italy.

——— *bursiformis* Buchner, *ibid.*, vol. 9, No. 62, p. 538, pl. 28, figs. 596–598. Recent, Island Ischia, Italy.

——— *caelata* Buchner, *ibid.*, vol. 9, No. 62, p. 533, pl. 26, figs. 552, 553. Subfossil and Recent, Island Ischia. (New name for: *Lagena squamosa-marginata* Sidebottom, 1906.)

——— *cavea* Buchner, *ibid.*, vol. 9, No. 62, p. 498, pl. 18, figs. 376, 377. Recent, Island Ischia, Italy.

——— *cincta* Buchner, *ibid.*, vol. 9, No. 62, p. 464, pl. 11, figs. 179, 180. Subfossil, Island Ischia. [Preoecupied by *Lagena* (*Fissurina*) *cincta* Seguenza, 1862, Foram. Monotalam. Messina, p. 62, pl. 2, fig. 31.]

——— *circumfossa* Buchner, *ibid.*, vol. 9, No. 62, p. 501, pl. 19, figs. 383–385. Subfossil, Island Ischia; Recent, Sicily, Italy.

——— *circumvallata* Buchner, *ibid.*, vol. 9, No. 62, p. 537, pl. 28, figs. 586, 587. Recent, Sicily, Italy.

——— *citriformis* Buchner, *ibid.*, vol. 9, No. 62, p. 439, pl. 6, fig. 89. Subfossil, Island Ischia, Italy.

——— *clavigera* Buchner, *ibid.*, vol. 9, No. 62, p. 529, pl. 26, figs. 544, 545. Recent, Island Ischia and Sicily, Italy.

——— *compta* Buchner, *ibid.*, vol. 9, No. 62, p. 536, pl. 27, figs. 582, 583. Subfossil and Recent, Island Ischia; Recent, Sicily, Italy.

——— *confirmata* Buchner, *ibid.*, vol. 9, No. 62, p. 470, pl. 12, figs. 219, 220. Subfossil, Island Ischia, Italy.

——— *cordiformis* Buchner, *ibid.*, vol. 9, No. 62, p. 541, pl. 29, figs. 630–632. Subfossil, Island Ischia, Italy.

——— *cornigera* Buchner, *ibid.*, vol. 9, No. 62, p. 514, pl. 22, figs. 445–452. Subfossil and Recent, Island Ischia; Recent, Sicily, Italy.

——— *corrosa* Buchner, *ibid.*, vol. 9, No. 62, p. 488, pl. 16, figs. 313–316. Subfossil and Recent, Island Ischia, Italy. [New name for: *Lagena orbignyana* (Seguenza, 1862) var. *lacunata* Sidebottom, 1910.]

——— *costae* Buchner, *ibid.*, vol. 9, No. 62, p. 510, pl. 21, figs. 424, 425. Subfossil and Recent, Island Ischia; Recent, Sicily, Italy. [Preoccupied by *Lagena* (*Phialina*) *costae* (Seguenza, 1862), Foram. Monotalam. Messina, pt. 2, p. 48 pl. 1, fig. 28.]

——— *crassa* Buchner, *ibid.*, vol. 9, No. 62, p. 470, pl. 12, figs. 221–223. Subfossil, Island Ischia, Italy.

——— *cribrata* Buchner, *ibid.*, vol. 9, No. 62, p. 472, pl. 12, figs. 232, 233. Recent, Island Ischia, Italy.

——— *cristigera* Buchner, *ibid.*, vol. 9, No. 62, p. 495, pl. 18, figs. 359–361. Subfossil and Recent, Island Ischia, Italy. (New name for: *Lagena castanea* Rhumbler, 1909; and for: *Lagena fimbriata* Heron-Allen and Earland, 1913.)

——— *crustosa* Buchner, *ibid.*, vol. 9, No. 62, p. 518, pl. 22, figs. 473–475. Recent, Island Ischia, Italy.

——— ——— ——— var. *devia* Buchner, *ibid.*, vol. 9, No. 62, p. 518, pl. 22, figs. 469–472 Subfossil and Recent, Island Ischia, Italy.

——— *cucullifera* Buchner, *ibid.*, vol. 9, No. 62, p. 470, pl. 12, figs. 224–227; pl. 18, figs. 374, 375. Subfossil, Island Ischia, Italy.

——— *cuniculifera* Buchner, *ibid.*, vol. 9, No. 62,

p. 535, pl. 27, fig. 581. Subfossil, Island Ischia, Italy.

——— *curvans* Buchner, *ibid.*, vol. 9, No. 62, p. 540, pl. 29, figs. 621–623. Subfossil, Island Ischia, Italy.

——— *decipiens* Buchner, *ibid.*, vol. 9, No. 62, p. 519, pl. 22, figs. 467–468. Subfossil, Island Ischia, Italy.

——— *defiorei* Buchner, *ibid.*, vol. 9, No. 62, p. 527, pl. 25, figs. 532–535. Recent, Sicily, Italy.

——— *deformata* Buchner, *ibid.*, vol. 9, No. 62, p. 428, pl. 4, fig. 64. Subfossil, Island Ischia, Italy.

——— *denticulifera* Buchner, *ibid.*, vol. 9, No. 62, p. 491, pl. 17, figs. 336 ?, 337–340. Subfossil and Recent, Island Ischia; Recent, Sicily, Italy.

——— *diaphana* Buchner, *ibid.*, vol. 9, No. 62, p. 480, pl. 14, figs. 266–271, Subfossil and Recent, Island Ischia, Italy.

——— *distycha* Buchner, *ibid.*, vol. 9, No. 62, p. 513, pl. 21, figs. 438, 439. Subfossil and Recent, Island Ischia, Italy.

——— *diversa* Buchner, *ibid.*, vol. 9, No. 62, p. 449, pl. 7, figs. 117–119. Subfossil and Recent, Island Ischia, Italy.

——— *dohrni* Buchner, *ibid.*, vol. 9, No. 62, p. 532, pl. 26, figs. 556–558. Subfossil and Recent, Island Ischia, Italy.

——— *earlandi* Buchner, *ibid.*, vol. 9, No. 62, p. 512, pl. 21, figs. 432, 433. Subfossil, Island Ischia, Italy.

——— *eburnea* Buchner, *ibid.*, vol. 9, No. 62, p. 458, pl. 9, figs. 146, 147. Recent, Island Ischia, Italy.

——— *fabiformis* Buchner, *ibid.*, vol. 9, No. 62, p. 541, pl. 29, figs. 633–635. Subfossil, Island Ischia, Italy.

——— *fallax* Buchner, *ibid.*, vol. 9, No. 62, p. 509, pl. 21, figs. 421–423. Subfossil, Island Ischia, Italy.

——— *fistulifera* Buchner, *ibid.*, vol. 9, No. 62, p. 467, pl. 12, figs. 208, 209. Recent, Island Ischia, Italy.

——— *folioformis* Buchner, *ibid.*, vol. 9, No. 62, p. 454, pl. 8, figs. 128–132. Recent, Island Ischia, Italy. (New Name for: *Lagena formosa* Brady, 1884.)

——— *fornasinii* Buchner, *ibid.*, vol. 9, No. 62, p. 529, pl. 26, figs. 548, 549. Recent, Island Ischia, Italy.

——— *fovigera* Buchner, *ibid.*, vol. 9, No. 62, p. 541, pl. 29, figs. 627–629. Subfossil, Island Ischia, Italy.

——— *frangens* Buchner, *ibid.*, vol. 9, No. 62, p. 504, pl. 19, figs. 407–409. Subfossil and Recent, Island Ischia, Italy.

——— *furcillifera* Buchner, *ibid.*, vol. 9, No. 62, p. 489, pl. 16, fig. 317; pl. 17, figs. 318–326. Subfossil and Recent, Island Ischia, Italy.

——— *georgii* Buchner, *ibid.*, vol. 9, No. 62, p. 443, pl. 6, figs. 95–97. Subfossil, Island Ischia, Italy.

——— *gibbera* Buchner, *ibid.*, vol. 9, No. 62, p. 423, pl. 3, figs. 48–50. Subfossil, Island Ischia; Recent, Sicily, Italy.

——— *granifera* Buchner, *ibid.*, vol. 9, No. 62, p. 490, pl. 17, figs. 331–333. Subfossil and Recent, Island Ischia, Italy.

——— ——— ——— var. *trimarginata* Buchner *ibid.*, vol. 9, No. 62, p. 491, pl. 17, figs. 334, 335, Recent, Sicily, Italy.

——— *gratiosa* Buchner, *ibid.*, vol. 9, No. 62, p. 487, pl. 16, figs. 300–302. Recent, off Sicily, Italy.

——— *guttata* Buchner, *ibid.*, vol. 9, No. 62, p. 468, pl. 12, figs. 214, 215. Subfossil and Recent, Island Ischia, Italy. (Note: *cave Lagena gutta* Smith, 1915.)

——— *guttula* Buchner, *ibid.*, p. 517, pl. 22, figs. 463–466. Subfossil, Island Ischia; Recent, Sicily, Italy.

——— *habenifera* Buchner, *ibid.*, vol. 9, No. 62, p. 464, pl. 11, figs. 182–191. Subfossil and Recent, Island Ischia, Italy.

——— *hamigera* Buchner, *ibid.*, vol. 9, No. 62, p. 530, pl. 26, figs. 550, 551. Subfossil and Recent, Island Ischia, Italy.

——— *heron-alleni* Buchner, *ibid.*, vol. 9, No. 62, p. 531, pl. 26, figs. 559–561. Subfossil, Island Ischia, Italy. (Note: This species name is preoccupied by Earland, 1934, Discovery Repts., vol. 10, p. 152, pl. 6, figs. 55–57.)

——— *hiulca* Buchner, *ibid.*, vol. 9, No. 62, p, 516, pl. 22, figs. 457, 458. Subfossil and Recent, Island Ischia; Recent, Sicily, Italy.

——— *humilis* Buchner, *ibid.*, vol. 9, No. 62, p. 515, pl. 22, figs. 453, 454. Recent, Island Ischia Italy.

——— *immoderata* Buchner, *ibid.*, vol. 9, No. 62, p. 466, pl. 11, figs. 195–197. Subfossil, Island Ischia, Italy.

——— *jasolini* Buchner, *ibid.*, vol. 9, No. 62, p. 466, pl. 11, figs. 198–200. Subfossil, Island Ischia. Italy.

——— *laevigata* (Reuss, 1850) var. *labiata* Buchner, *ibid.*, vol. 9, No. 62, p. 476 pl. 12, figs. 201–207. Subfossil and Recent, Island Ischia, Italy.

——— *laguncula* Buchner, *ibid.*, vol. 9, No. 62, p. 492, pl. 17, figs. 341, 342. Subfossil and Recent, Island Ischia, Italy.

——— *lecythiformis* Buchner, *ibid.*, vol. 9, No. 62, p. 492, pl. 17, figs. 349–352. Subfossil and Recent, Island Ischia; Recent, Sicily, Italy.

——— *lentiformis* Buchner, *ibid.*, vol. 9, No. 62, p. 538, pl. 28, figs. 593–595. Subfossil and Recent, Island Ischia, Italy.

——— *marmoraria* Buchner, *ibid.*, vol. 9, No. 62, p. 490, pl. 17, figs. 329, 330. Subfossil and Recent, Island Ischia, Italy.

——— *mazzarensis* Buchner, *ibid.*, vol. 9, No. 62, p. 462, pl. 10, figs. 165, 166. Subfossil, Island Ischia, Italy.

——— *mennellae* Buchner, *ibid.*, vol. 9, No. 62, p. 458, pl. 9, figs. 148–151. Subfossil, Island Ischia, Italy.

——— *micans* Buchner, *ibid.*, vol. 9, No. 62, p. 439, pl. 6, fig. 88. Subfossil, Island Ischia, Italy. (New name for: *Entosolenia aspera* Moebius, 1880.)

——— *milianae* Buchner, *ibid.*, vol. 9, No. 62, p. 528, pl. 25, figs. 539–541. Subfossil, Island Ischia, Italy.

——— *molesta* Buchner, *ibid.*, vol. 9, No. 62, p. 481, pl. 14, figs. 272–274. Subfossil, Island Ischia; Recent, Sicily, Italy.

——— *neglecta* Buchner, *ibid.*, vol. 9, No. 62, p. 463, pl. 11, figs. 173–178. Subfossil and Recent, Island Ischia; Recent, Sicily, Italy.

——— *neglecta* Buchner, *ibid.*, vol. 9, No. 62, p. 503, pl. 19, figs. 405, 406. Subfossil, Island Ischia, Italy. (Note: This is a homonym of *Lagena neglecta* Buchner, 1940, *ut supra*.)

——— *neptuni* Buchner, *ibid.*, vol. 9, No. 62, p. 484, pl. 15, figs. 294–296. Recent, Island Ischia, Italy.

——— *nucelloides* Buchner, *ibid.*, vol. 9, No. 62, p. 518, pl. 22, figs. 476, 477. Subfossil and Recent, Island Ischia; Recent, Sicily, Italy.

——— ——— ——— var. *corrosa* Buchner, *ibid.*, vol. 9, No. 62, p. 519, pl. 22, fig. 478. Recent, Sicily, Italy. (Note: the varietal name is preoccupied by *Lagena corrosa* Buchner, 1940, *ut supra*.)

——— *nummiformis* Buchner, *ibid.*, vol. 9, No. 62, p. 457, pl. 8, figs. 135–138. Subfossil and Recent, Island Ischia, Italy.

——— *obesa* Buchner, *ibid.*, vol. 9, No. 62, p. 537, pl. 28, figs. 588, 589. Recent, Island Ischia, Italy.

——— *oblectans* Buchner, *ibid.*, vol. 9, No. 62, p. 487, pl. 16, figs. 310–312. Subfossil, Island Ischia, Italy.

——— *ollula* Buchner, *ibid.*, vol. 9, No. 62, p. 424, pl. 3, figs. 51–53. Subfossil Island Ischia, Italy. (Note: *cave Lagena ollulata* Matthes, 1939.)

——— *orbignyana* (Seguenza, 1862) var. *rhumbleri* Buchner, *ibid.*, vol. 9, No. 62, p. 505, pl. 20, figs. 413, 414, Subfossil and Recent, Island, Ischia, Italy.

——— *orbilifera* Buchner, *ibid.*, vol. 9, No. 62, p. 501, pl. 19, figs. 381, 382. Recent, Island Ischia, Italy.

——— *pirellii* Buchner, *ibid.*, vol. 9, No. 62, p. 508, pl. 20, fig. 420. Recent, Sicily, Italy.

——— *piriformis* Buchner, *ibid.*, vol. 9, No. 62, p. 462, pl. 10, figs. 163, 164. Subfossil, Island Ischia, Italy.

——— *pretiosa* Buchner, *ibid.*, vol. 9, No. 62, p. 502, pl. 19, figs. 398, 399. Subfossil and Recent, Island Ischia, Italy.

——— *pseudoglobosa* Buchner, *ibid.*, vol. 9, No. 62, p. 463, pl. 11, figs. 167–172. Subfossil and Recent, Island Ischia, Italy.

——— *pseudomarginata* Buchner, *ibid.*, vol. 9, No. 62, p. 534, pl. 27, figs. 566–575. Subfossil and Recent, Island Ischia; Recent, Sicily, Italy.

——— ——— ——— var. *benecincta* Buchner, *ibid.*, vol. 9, No. 62, p. 535, pl. 27. figs. 576, 577. Recent, Island Ischia, Italy.

——— *pseudoorbignyana* Buchner, *ibid.*, vol. 9, No. 62, p. 460, pl. 10, figs. 157–160. Subfossil and Recent, Island Ischia, Italy.

——— ——— ——— var. *tumulosa* Buchner *ibid.*, vol. 9, No. 62, p. 461, pl. 10, figs. 161, 162. Subfossil, Island Ischia, Italy.

——— *pulviniformis* Buchner, *ibid.*, vol. 9, No. 62, p. 525, pl. 25, figs. 523–525. Subfossil, Island Ischia; Recent, Sicily, Italy.

——— *punctatissima* Buchner, *ibid.*, vol. 9, No. 62, p. 464, pl. 11, fig. 181. Subfossil, Island Ischia, Italy.

——— *punctigera* Buchner, *ibid.*, vol. 9, No. 62, p. 490, pl. 17, figs. 327, 328. Subfossil and Recent, Island Ischia, Italy.

——— *pustulata* Buchner, *ibid.*, vol. 9, No. 62, p. 503, pl. 19, figs. 400, 401, Subfossil, Island Ischia, Italy.

——— *recurrens* Buchner, *ibid.*, vol. 9, No. 62, p. 503, pl. 19, figs. 402–404, Subfossil, Island Ischia; Recent, Sicily, Italy.

——— *reflectens* Buchner, *ibid.*, vol. 9, No. 62, p. 516, pl. 22, figs. 459–462. Subfossil and Recent, Island Ischia; Recent, Sicily, Italy.

——— *removens* Buchner, *ibid.*, vol. 9, No. 62, p. 539, pl. 28, figs. 601, 602; pl. 29, figs. 614–620. Subfossil and Recent, Island Ischia, Italy.

——— *rittmanni* Buchner, *ibid.*, vol. 9, No. 62, p. 514, pl. 22, figs. 481–486. Subfossil and Recent, Island Ischia, Italy.

——— *robusta* Buchner, *ibid.*, vol. 9, No. 62, p. 457, pl. 9, figs. 141–143. Recent, Sicily, Italy.

——— *saturni* Buchner, *ibid.*, vol. 9, No. 62, p. 535, pl. 27, figs. 578–580. Recent, Sicily, Italy.

——— *scutelliformis* Buchner, *ibid.*, vol. 9, No. 62, p. 537, pl. 27, figs. 584, 585. Recent, Island Ischia, Italy.

——— *seguenzae* Buchner, *ibid.*, vol. 9, No. 62, p. 468, pl. 12, figs. 216–218. Subfossil and Recent, Island Ischia; Recent, Sicily, Italy. (New name for: *Lagena margino-perforata* Sidebottom, 1906.)

——— *serica* Buchner, *ibid.*, vol. 9, No. 62, p. 451, pl. 8, fig. 127. Subfossil and Recent, Island Ischia, Italy. (New name for: *Lagena lagenoides* Williamson, 1858 var. *tenuistriata* Balkwill and Millett, 1884).

——— *sidebottomi* Buchner, *ibid.*, vol. 9, No. 62, p. 484, pl. 16, figs. 297–299. Subfossil and Recent, Island Ischia, Italy. (Note: Species name is preoccupied by Earland, 1934, Discovery Repts., vol. 10, p. 161, pl. 7, fig. 23.)

——— *silvestrii* Buchner, *ibid.*, vol. 9, No. 62, p. 501, pl. 19, figs. 396, 397. Subfossil and Recent, Island Ischia; Recent, Sicily, Italy.

——— *simplex* Buchner, *ibid.*, vol. 9, No. 62, p. 465, pl. 11, figs. 193, 194. Recent, Island Ischia, Italy. [Note: Species name is preoccupied by *Lagena* (*Oolina*) *simplex* (Terquem, 1862), Foram. Lias, 2nd Mém., p. 112, pl. 5, fig. 2.]

——— *solenandri* Buchner, *ibid.*, vol. 9, No. 62, p. 472, pl. 12, figs. 230, 231. Subfossil, Island Ischia, Italy.

——— *spathiformis* Buchner, *ibid.*, vol. 9, No. 62, p. 467, pl. 12, figs. 210, 211. Subfossil, Island Ischia, Italy.

——— *staphyllearia* (Schwager, 1866) var. *perforatissima* Buchner, *ibid.*, vol. 9, No. 62, p. 525, pl. 28, figs. 590, 591. Subfossil, Island Ischia, Italy.

——— *subtilis* Buchner, *ibid.*, vol. 9, No. 62, p. 493, pl. 17, figs. 343–345. Subfossil and Recent, Island Ischia; Recent, Sicily, Italy.

——— *tigillifera* Buchner, *ibid.*, vol. 9, No. 62, p. 519, pl. 22, figs. 479, 480. Subfossil, Island Ischia, Italy.

——— *torquens* Buchner, *ibid.*, vol. 9, No. 62, p.

511, pl. 21, figs. 428–431. Subfossil and Recent, Island Ischia; Recent, Sicily, Italy.

——— *turbiniformis* Buchner, *ibid.*, vol. 9, No. 62, p. 467, pl. 12, figs. 212, 213. Subfossil, Island Ischia, Italy.

——— *turgida* Buchner, *ibid.*, vol. 9, No. 62, p. 538, pl. 28, figs. 599, 600. Recent, Island Ischia Italy.

——— *tympanigera* Buchner, *ibid.*, vol. 9, No. 62, p. 540, pl. 29, figs. 624–626. Subfossil, Island Ischia, Italy.

——— *tympaniolum* Buchner, *ibid.*, vol. 9, No. 62, p. 481, pl. 15, figs. 275–278. Subfossil and Recent, Island Ischia, Italy.

——— *uncifera* Buchner, *ibid.*, vol. 9, No. 62, p. 531, pl. 26, figs. 554, 555. Subfossil and Recent, Island Ischia, Italy.

——— *varioperforata* Buchner, *ibid.*, vol. 9, No. 62, p. 494, pl. 18, figs. 353–358. Subfossil and Recent, Island Ischia; Recent, Sicily, Italy. [New name for: *Lagena marginata* (Walker and Boys, 1784) var. *semimarginata* Wiesner, 1931.]

——— *vitreola* Buchner, *ibid.*, vol. 9, No. 62, p. 477, pl. 13, figs. 256–258. Subfossil and Recent, Island Ischia; Recent, Sicily, Italy.

Lingulina (?) separans Buchner, *ibid.*, vol. 9, No. 62, p. 460, pl. 9, fig. 156. Subfossil, Island Ischia, Italy

Nanicella dainae Tchernysheva, Bull. Soc. Natural. Moscou, vol. 48, sect. géol. vol. 18, p. 127, text fig. 1. Lower Carboniferous, Southern Urals region, Soviet Russia.

Palaeotextularia lata Tchernysheva, *ibid.*, vol. 48, sect. géol. vol. 18, p. 131. Onomatype. Lower Carboniferous, Southern Urals region, Soviet Russia.

PARAENDOTHYRA gen. nov. Tchernysheva, *ibid.*, vol. 48, sect. géol. vol. 18, p. 129. Family Lituolidae. Genotype: *Paraendothyra navlikini* Tchernysheva, 1940, *ut infra*. Lower Carboniferous.

——— *navlikini* Tchernysheva, *ibid.*, vol. 48, sect. géol., vol. 18, p. 129, pl. 1, figs. 1, 2; pl. 2, figs. 4, 5; text figs. 2–5. Lower Carboniferous, South Urals region, Soviet Russia.

Parafusulina shiptoni Dunbar, 1940, Rec. Geol. Surv. India, Prof. Pap., vol. 75, No. 5, p. 1, pl. 1, figs. 1–7. Permian, Karakoram, British India.

Spiroplectammina parva Tchernysheva, Bull. Soc. Natural. Moscou, vol. 48, sect. géol., vol. 18, p. 130, pl. 2, figs. 1, 2. Lower Carboniferous, South Urals region, Soviet Russia.

STOMIOSPHAERA gen nov. Wanner, Palaeont. Zeitschr., vol. 22, p. 76. Family Stomiosphaeridae Wanner, 1940, *ut infra*. Genotype: *Stomiosphaera moluccana* Wanner, 1940, *ut infra*. Upper Jurassic and Lower Cretaceous.

——— *moluccana* Wanner, *ibid.*, vol. 22, p. 76, text figs. 1–18; pl. i, pl. ii. Upper Jurassic (Malm), and Lower Cretaceous (Neocomian), Eastern East-Indian Archipelago.

STOMIOSPHAERIDAE fam. nov. Wanner, ibid., vol. 22, p. 92. Includes the genus *Stomiosphaera* Wanner, 1940, *ut supra*. Malm-Neocomian.

FORM WITH NOMENCLATURA APERTA

Parafusulina sp. A Dunbar, Rec. Geol. Surv. India, Prof. Pap. vol. 75, No. 5, p. 4, pl. 1, fig. 8. Permian, Karakoram, British India.

NOMEN NUDUM

Fusulina constricta Johnson, Proc. Missouri Acad. Sci., vol. 5, p. 128. Lower Pennsylvanian, Missouri, is a *nomen nudum*.

SUPPLEMENT FOR THE YEAR 1941

Ammobaculites beisseli Marie, Mém. Mus. Nation. Hist. Nat. Paris, n.s., vol. 12, fasc. 1, p. 22, pl. 1, fig. 11. Senonian, Paris Basin, France. For: *Haplophragmium compressum* Beissel, 1891, Abhandl. k. Preuss. geol. Landes-Anst. Berlin, p. 16, pl. 4, fig. 16.

Ammodiscoides clypeiformis Frentzen, Beitr. Naturkundl. Forsch. Ober-Rheingeb., vol. 6, p. 302, pl. 1, fig. 6. Liassic, Germany.

Amphisorus see *Marginopora*.

Anomalina cubensis van Bellen, Proc. Nederl. Akad. Wetensch., vol. 44, p. 1144, pl. figs.4–6 Lower Oligocene, Cuba.

——— *dalmatina* van Bellen, *ibid.*, vol. 44, p. 1001, pl. fig. 26. Eocene, Dalmatia, Yugoslavia.

——— *keijzeri* Montagne, Thesis Univ. Utrecht, p. 55, pl. 6, figs. 38–40. Eocene, Dalmatia, Yugoslavia. For: *Anomalina n. sp.* Keijzer, Proc. Kon. Nederl. Akad. Wetensch., vol. 41, p. 990, 1938.

——— *monterelensis* Marie, Mém. Mus. Nation. Hist. Nat. Paris, n.s., vol. 12, fasc. 1, p. 343, pl. 37, fig. 342. Senonian, Paris Basin, France.

——— *stelligera* Marie, *ibid.*, vol. 12, fasc. 1, p. 245, pl. 37, fig. 344. Senonian, Paris Basin, France.

——— *tenuissimus* (Reuss, 1858) var. *evoluta* van Bellen, Proc. Nederl. Akad. Wetensch., vol. 44, p. 1001, pl. fig. 25. Eocene, Dalmatia, Yugoslavia.

Arenobulimina conica Marie, Mém, Mus. Nation. Hist. Nat. Paris, n.s., vol. 12, fasc. 1, p. 48, pl. 4, fig. 35. Senonian, Paris Basin, France. (Note: *cave Arenobulimina conoidea* (Perner, 1892).)

——— *cytherea* Marie, *ibid.*, vol. 12, fasc. 1, p. 52, pl. 4, fig. 40. Senonian, Paris Basin, France.

——— *gutta* Marie, *ibid.*, vol. 12, fasc. 1, p. 51, pl. 4, fig. 38. Senonian, Paris Basin. France.

——— *ovoidea* Marie, *ibid.*, vol. 12, fasc. 1, p. 51, pl. 4, fig. 39. Senonian, Paris Basin, France.

——— *pseudorbignyi* Marie, *ibid.*, vol. 12, fasc. 1, p. 50, pl. 4, fig. 37. Senonian, Paris Basin, France.

——— *sphaerica* Marie, *ibid.*, vol. 12, fasc. 1, p. 49, pl. 4, fig. 36. Senonian, Paris Basin, France.

Astacolus see *Cristellaria*.

Asterigerina frankei ten Dam and Reinhold, Geol. en Mijnbouw, vol. 3, p. 222, pl. 1, fig. 3. Oligocene to Middle Miocene, Netherlands.

——— *staeschei* ten Dam and Reinhold, *ibid.*,

vol. 3, p. 222, pl. 1, fig. 2. Middle and Lower Miocene, Northwestern Europe. For: *Asterigerina gürichi* Staesche and Hiltermann, 1940 (non Franke, 1912), Abhandl. Reichsst. Bodenforschg. Berlin, N. F. Heft 201, pl. 49, figs. 12, 13.

ATAXOGYROIDINA gen. nov. Marie, Mém. Mus. Nation. Hist. Nat. Paris. n.s., vol. 12, fasc. 1, p. 53. Fam. Valvulinidae, Genotype: *Bulimina variabilis* d'Orbigny, 1840, Mém, Soc. géol. France, vol. 4, No. 1, p. 40, pl. 4, figs. 9–11. Upper Cretaceous.

——— *concava* Marie, *ibid.*, vol. 12, fasc. 1, p. 58, pl. 5, fig. 45. Senonian, Paris Basin, France.

——— *cylindrica* Marie, *ibid.*, vol. 12, fasc. 1, p. 57, pl. 5, fig. 46. Senonian, Paris Basin, France.

——— *gibbosa* Marie, *ibid.*, vol. 12, fasc. 1, p. 58, pl. 5, fig. 49. Senonian, Paris Basin, France.

——— *ovoidea* Marie, *ibid.*, vol. 12, fasc. 1, p. 57, pl. 5, fig. 48. Senonian, Paris Basin, France.

BOLIVINITELLA gen. nov. Marie, *ibid.*, vol. 12, fasc. 1, p. 189. Family Heterohelicidae. Genotype: *Bolivinita eleyi* Cushman, 1927, Contr. Cushman Lab. Foram. Res., vol. 2, p. 91, pl. 2, fig. 11. Upper Cretaceous. (Note: *cave Bolivinella* Cushman, 1927.)

——— *eleyi* (Cushman, 1927) var. *polygonalis* Marie, *ibid.*, vol. 12, fasc. 1, p. 191, pl. 29, fig. 283. Senonian, Paris Basin, France.

Bolivinoides decorata (Jones, 1886) var. *laevigata* Marie, *ibid.*, vol. 12, fasc. 1, p. 189, pl. 29, fig. 281. Senonian, Paris Basin, France.

Bulimina pseudoacuta Marie, *ibid.*, vol. 12, fasc. 1, p. 203, pl. 32, fig. 300. Senonian, Paris Basin France.

——— *strobila* Marie, *ibid.*, vol. 12, fasc. 1, p. 204, pl. 32, fig. 302. Senonian, Paris Basin, France.

Buliminella guttiformis Marie, *ibid.*, vol. 12, fasc. 1, p. 200, pl. 31, fig. 295. Senonian, Paris Basin, France.

——— *obtusa* (d'Orbigny, 1840) var. *inflata* Marie, *ibid.*, vol. 12, fasc. 1, p. 199, pl. 31, fig. 292. Senonian, Paris Basin, France.

——— *ovulum* (Reuss, 1844) var. *hemicircularis* Marie, *ibid.*, vol. 12, fasc. 1, p. 202, pl. 31, figs. 296, 297. Senonian, Paris Basin, France.

——— ——— (———) var. *triangularis* Marie, *ibid.*, vol. 12, fasc. 1, p. 202, pl. 31, figs. 298, 299. Senonian, Paris, Basin, France.

Cadosina fusca Wanner, 1940, var. *misolensis* Vogler, Palaeontogr., Suppl.-Bd. 4, (4), Lief. 4, p. 281, pl. 20, fig. 7. Neocomian, Misol, Netherlands East Indies. (Note; preoccupied by *Cadosina misolensis* Vogler, 1941, *ut infra.*)

——— *heliosphaera* Vogler, *ibid.*, Suppl. -Bd. 4, (4), Lief. 4, p. 281, pl. 20, fig. 6. Neocomian, Misol, Netherlands East Indies.

——— *ingens* Vogler, *ibid.*, Suppl. -Bd. 4, (4), Lief. 4, p. 281, pl. 21, fig. 59. Neocomian and Upper Cretaceous, Miso., Netherlands East Indies.

——— *lapidosa* Vogler, *ibid.*, Suppl. -Bd. 4, (4), Lief. 4, p. 281, pl. 21, fig. 58. Neocomian, Misol, Netherlands East Indies.

——— *misolensis* Vogler, *ibid.*, Suppl. -Bd. 4, (4), Lief. 4, p. 281, pl. 20, fig. 1-B, 8. Upper Jurassic and Neocomian, Misol, Netherlands East Indies.

——— *radiata* Vogler, *ibid.*, Suppl. -Bd. 4, (4), Lief. 4, p. 281, pl. 20, fig. 4. Neocomian, Misol, Netherlands East Indies.

——— *sublapidosa* Vogler, *ibid.*, Suppl. -Bd. 4, (4), Lief. 4, p. 280, pl. 20, fig. 5. Neocomian, Misol, Netherlands East Indies.

CADOSINELLA gen. nov. Vogler, *ibid.*, Suppl. -Bd. 4, (4), Lief. 4, p. 282. Family Cadosinidae Wanner. Genotype: *Cadosinella gracillimoides* Vogler, 1941, *ut infra.* Upper Cretaceous.

——— *gracillimoides* Vogler, *ibid.*, Suppl. -Bd. 4, (4), Lief. 4, p. 282, pl. 21, fig. 63. Upper Cretaceous, Misol, Netherlands East Indies.

Calcisphaera canaliculata Derville, Bull. Soc. géol. France, (5), vol. 11 (published December 1942), p. 364, pl. 7, figs. 1–3. Carboniferous, France.

——— *polyderma* Derville, *ibid.*, vol. 11 (published December 1942), p. 364, pl. 7, fig. 5. Carboniferous, France.

CERCIDINA gen. nov. Vogler, Palaeontogr., Suppl. -Bd. 4, (4), Lief. 4, p. 290. Protozoon *incertae sedis*, probably belonging to the Foraminifera. Genotype: *Cercidina supracretacea* Vogler, 1941, *ut infra.* Upper Cretaceous.

——— *supracretacea* Vogler, *ibid.*, Suppl. -Bd. 4, (4), Lief. 4, p. 290, pl. 20, figs. 9, 10; text figs. 1–3. (Protozoon *incertae sedis*, probably belonging to the Foraminifera). Upper Cretaceous, Misol, Netherlands East Indies.

Cibicides cubensis van Bellen, Proc. Nederl. Akad. Wetensch., vol. 44, p. 1145, pl. figs. 21–23. Lower Oligocene, Cuba.

——— *dalmatina* van Bellen (nom. nov.) *ibid.*, vol. 44, p. 1002, pl. fig. 30. Eocene, Dalmatia Yugoslavia. New name for: *Truncatulina dutemplei* Reuss, 1866 (non d'Orbigny, 1846) Denkschr. K. Akad. Wiss. Wien., vol. 25, p. 160 pl. 4, fig. 16.

——— *dorsmani* van Bellen, *ibid.*, vol. 44, p. 1002, pl. fig. 33. Eocene, Dalmatia, Yugoslavia.

——— *keijzeri* van Bellen, *ibid.*, vol. 44, p. 1002, pl. fig. 31. Eocene, Dalmatia, Yugoslavia.

——— *lobatulus* (Walker and Jacob, 1798) var. *grossa* ten Dam and Reinbold, Mededeel. Geol. Stitchting Haarlem, (C), vol. 5, No. 1, p. 62, pl. 5, fig. 5; pl. 6, fig. 1. Lower and Middle Pliocene, Holland.

——— *scaldisiensis* ten Dam and Reinhold, *ibid.*, (C), vol. 5, No. 1 p. 62, pl. 5, fig. 6; pl. 6, fig. 2. Middle Pliocene, Holland.

——— *tschoppi* van Bellen, Proc. Nederl. Akad. Wetensch., vol. 44, p. 1145, pl. figs. 16–20. Lower Oligocene, Cuba.

——— *voltziana* (d'Orbigny, 1840) var. *denticulata* Marie, Mém. Mus. Nation. Hist. Nat. Paris, n.s., vol. 12, fasc. 1, p. 248, pl. 37, figs. 348, 349. Senonian, Paris Basin, France.

Citharina gracilina Marie, *ibid.*, vol. 12, fasc. 1, p. 113, pl. 13, fig. 160. Senonian, Paris Basin. France.

Citharinella elongata Marie, *ibid.*, vol. 12, fasc. 1,

p. 135, pl. 16, figs. 191, 192. Senonian, Paris Basin, France.

——— *watersi* (Cushman, 1936), var. *ornata* Marie, *ibid.*, vol. 12, fasc. 1, p. 134, pl. 16, fig. 190. Senonian, Paris Basin, France.

COPROLITHINA gen. nov. Marie, *ibid.*, vol. 12, fasc. 1, p. 37. Family Valvulinidae. Genotype: *Coprolithina subcyclindrica* Marie, 1941, *ut infra*. Upper Cretaceous.

——— *subcylindrica* Marie, *ibid.*, vol. 12, fasc. 1, p. 37, pl. 6, fig. 58. Senonian, Paris Basin, France.

CRIBROSPIRELLA gen nov. Marie, *ibid.*, vol. 12, fasc. 1, p. 28. Family Lituolidae. Genotype: *Lituola difformis* Lamarck, 1804, Ann. Museum, vol. 5, p. 273, pl. 62, fig. 13.

Cristellaria (*Astacolus*) *micropunctata* Frentzen, Beitr. Naturkundl. Forschg. Ober-Rheingebiet, vol. 6, p. 350, pl. 5, figs. 23–28. Dogger (Middle Jurassic), Germany.

——— (———) *pseudoradiata* Frentzen, *ibid.*, vol. 6, p. 351, pl. 5, figs. 15–20. Dogger (Middle Jurassic), Germany.

Cristellaria (*Lenticulina*) *paalzowi* nom. nov. Frentzen, *ibid.*, vol. 6, p. 355. Jurassic, Germany. New name for: *Lenticulina dubia* Paalzow, 1932, Jahresb. Ver. Vaterl. Naturk. Württemberg, Jahrg. 88, p. 103, pl. 6, fig. 15, 18–19.

Cristellaria (*Planularia*) *müller-stolli* Frentzen, *ibid.*, p. 346, pl. 5, fig. 1. Liassic, Germany.

Cyclammina tani Ishizaki, Taiwan Tigaku Kizi, vol. 12, p. 25. pl. 4, figs. 1–5. Paleogene and Miocene, Formosa.

CYCLAMMININAE subfam. nov. Marie, Mém. Mus. Nation. Hist. Nat. Paris, n.s., vol. 12, fasc. 1, p. 257. (Note: Replaces the subfam. Lituolinae of the family Lituolidae and includes the "lituolid genera with labyrinthic chambers.")

Dentalina bohemiensis nom. nov. van Bellen, Proc. Nederl. Akad. Wetensch. vol. 44, p. 998, pl. fig. 11. Eocene, Dalmatia, Yugoslavia. New name for: *Dentalina annulata* Reuss, 1845, Verstein. Böhm. Kreideform., vol. 1, pl.8, fig. 4 (non pl. 13, fig. 21).

——— *jarvisi* Montagne, nom. nov., Thesis Univ. Utrecht, p. 51, pl. 6, fig. 22. New name for: *Dentalina inornata* Cushman and Jarvis, 1930 (non d'Orbigny, 1846), Jour. Paleontology, vol. 4, p. 359, pl. 32, fig. 13. (Note: The species name is incorrectly spelled "*jarvesi*".)

——— *ovoidea* Marie, Mém. Mus. Nation. Hist. Nat. Paris, n.s., vol. 12, fasc. 1, p. 89, pl. 11, figs. 131–134. Senonian, Paris Basin, France.

——— *recta* Marie, *ibid.*, vol. 12, fasc. 1, p. 93, pl. 12, fig. 149. Senonian, Paris Basin, France. [Note: The species-name is preoccupied by a) *Nautilus* (*Dentalina*) *rectus* Montagu, 1803, Test. Brit. p. 197, and Suppl., 1808, p. 82, pl. 19, figs. 4, 7.; b) *Dentalina recta* Gosse, 1855, Marine Zool., p. 12, text fig. 11; and c) *Dentalina recta* Seguenza, 1880, Mem. R. Accad. Lincei, Clase Sci. Fis. Mat. e Nat., Roma, (3), vol. 6, p. 221. *Cave*: *Nodosaria recta* Schwager, 1866.]

DENTALINOIDES gen. nov. Marie, *ibid.*, vol. 12 fasc. 1, p. 207. Family Ellipsoidinidae. Genotype: *Dentalinoides canulina* Marie, 1941, *ut infra*. Upper Cretaceous.

——— *antennula* Marie, *ibid.*, vol. 12, fasc. 1, p. 208, pl. 32, fig. 308. Senonian, Paris Basin, France.

——— *canulina* Marie, *ibid.*, vol. 12, fasc. 1, p. 208, pl. 32, figs. 306, 307. Senonian, Paris, Basin, France.

Dimorphina globuliniformis Marie, *ibid.*, vol. 12, fasc. 1, p. 176, pl. 27, fig. 259. Senonian, Paris Basin, France.

Discorbis clementiana (d'Orbigny, 1840) var. *costata* Marie, *ibid.*, vol. 12, fasc. 1, p. 214, pl. 33, fig. 313. Senonian, Paris Basin, France.

——— ——— (———) var. *laevigata* Marie, *ibid.*, vol. 12, fasc. 1, p. 212, pl. 33, fig. 309. Senonian, Paris Basin, France. [Note: This varietal name is preoccupied by *Discorbis* (*Aristerospira*) *laevigata* (Ehrenberg, 1858) Monatsber. k. Preuss. Akad. Wiss., p. 16; and Abhandl. k. Akad. Wiss. Berlin, 1872 (1873), pl. 11, fig. 10.]

——— ——— (———) var. *rugosa* Marie, *ibid.*, vol. 12, fasc. 1, p. 213, pl. 33, figs. 310, 311. Senonian, Paris Basin, France. [Note: This variety is preoccupied by *Discorbis* (*Rosalina*) *rugosa* (d'Orbigny, 1839), Voyages Amér. Méridion., vol. 5, pt. 5, "Foraminifères." p. 42, pl. 2, figs. 12–14.]

——— *lorneiana* (d'Orbigny, 1840) var. *costulata* Marie, *ibid.*, vol. 12, fasc. 1, p. 216, pl. 34, fig. 315. Senonian, Paris Basin, France.

——— *planicostae* Frentzen, Beitr. Naturk. Forschg. Oberrheingebiet, vol. 6, p. 367, pl. 7, figs. 16, 17. Liassic. Germany

EGGERELLINA gen. nov. Marie, Mém. Mus. Nation. Hist. Nat. Paris, n.s., vol. 12, fasc. 1, p. 31. Family Valvulinidae. Genotype: *Bulimina brevis* d'Orbigny, 1840, Mém. Soc. géol. France, vol. 4, No. 1, p. 41, pl. 4, figs. 13, 14. Upper Cretaceous. (Note: *cave* subfamily Eggerellinae.)

——— *brevis* (d'Orbigny, 1840) var. *conica* Marie, *ibid.*, vol. 12, fasc. 1, p. 34, pl. 7, fig. 70. Senonian, Paris Basin, France. For: *Bulimina intermedia* Franke, 1928 (non Reuss, 1846), Abhandl. Preuss. Geol. Landes-Anst., vol. 111. p. 160, pl. 14, fig. 23.; and for: *Bulimina murchisoniana* Cushman and Parker, 1934 (non d'Orbigny, 1840), Contr. Cushman Lab. Foram. Res. vol. 10, p. 29, pl. 5, fig. 7.

——— *gibbosa* Marie, *ibid.*, vol. 12, fasc. 1, p. 35, pl. 7, figs. 71, 73. Senonian, Paris Basin, France.

——— ——— ——— var. *conica* Marie, *ibid.*, vol. 12, fasc. 1, p. 35, pl. 7, figs. 71 a–d. Senonian, Paris Basin, France. [Note: The varietal name is preoccupied by *Eggerellina brevis* (d' Orbigny) var. *conica* Marie, 1941, *ut supra*.]

——— ——— ——— var. *globulosa* Marie, *ibid.*, vol. 12, fasc. 1, p. 35, pl. 7, figs. 73 a–d. Senonian, Paris Basin, France. [Note: The varietal name is preoccupied by *Eggerellina intermedia* (Reuss) var. *globulosa* Marie, 1941, *ut infra*.]

——— *intermedia* (Reuss, 1846) var. *globulosa* Marie, *ibid.*, vol. 12, fasc. 1, p. 33, pl. 7, fig. 69. Senonian, Paris Basin, France.

——— *ovoidea* Marie, *ibid.*, vol. 12, fasc. 1, p.

36, pl. 7, fig. 74. Senonian, Paris Basin, France.
——— *ventricosa* Marie, *ibid.*, vol. 12, fasc. 1, p. 36, pl. 7, fig. 72. Senonian, Paris Basin, France.

Elphidium pseudolessoni ten Dam and Reinhold, Mededeel. Geol. Sticht. Haarlem, (C), vol. 5, No. 1, p. 53, pl. 3, fig. 10; pl. 6, fig. 11. Pliocene and Lower Pleistocene, Holland, For; *Polystomella crispa* Jones, Parker and Brady, 1866, Foram. Crag., p. 353, pl. 2, figs. 42 and 43.

ENANTIOCRISTELLARIA gen. nov. Marie, Mém. Mus. Nation. Hist. Nat. Paris, n.s., vol. 12, fasc. 1, p. 162. Family Enantiomorphinidae Marie, 1941, *ut infra*. Genotype: *Cristellaria navicula* d'Orbigny, 1840, Mém. Soc. géol. France, vol. 4, No. 1, p. 27, pl. 2, figs. 19, 20. Upper Cretaceous.
——— *cayeuxi* Marie, *ibid.*, vol. 12, fasc. 1,p. 163, pl. 20, fig. 231. Senonian, Paris Basin, France.

ENANTIODENTALINA gen. nov. Marie, *ibid.*, vol. 12, fasc. 1, p. 149. Family Enantiomorphinidae Marie, 1941, *ut infra*. Genotype: *Dentalina communis* d'Orbigny, 1840, Mém. Soc. géol. France, vol. 4, No. 1, p. 13, pl. 1, fig. 4. Upper Cretaceous.
——— *communis* (d'Orbigny, 1840) var. *gigantea* Marie, *ibid.*, vol. 12, fasc. 1, p. 151, pl. 19, figs 210, 211. Senonian, Paris Basin, France.
——— ——— (———) var. *irregularis* Marie, *ibid.*, vol. 12, fasc. 1, p. 151, pl. 19, figs. 207–209. Senonian, Paris Basin, France.
——— ——— (———) forma *typica* Marie, *ibid.*, vol. 12, fasc. 1, p. 151, pl. 19, figs. 204, 205 a–d, 206. Upper Cretaceous, Paris Basin, France.
——— *monterelensis* Marie, *ibid.*, vol. 12, fasc. 1, p. 153, pl. 19, fig. 216. Senonian, Paris Basin, France.
——— *scalaris* Marie, *ibid.*, vol. 12, fasc. 1, p. 153, pl. 19, figs. 217–220. Senonian, Paris Basin, France.
——— *unguis* Marie, *ibid.*, vol. 12, fasc. 1, p. 155, pl. 19, fig. 222. Senonian, Paris Basin, France.
——— *variabilis* Marie, *ibid.*, vol. 12, fasc. 1, p. 152, pl. 19, fig. 215. Senonian, Paris Basin, France.

ENANTIOMARGINULINA gen. nov. Marie, *ibid.*, vol. 12, fasc. 1, p. 163, Family Enantiomorphinidae Marie, 1941, *ut infra*. Genotype: *Enantiomarginulina d'orbignyi* Marie, 1941, *ut infra*. Upper Cretaceous.
——— *d'orbignyi* Marie, *ibid.*, vol. 12, fasc. 1, p. 164, pl. 20, fig. 232; pl. 21, fig. 233. Senonian, Paris Basin, France. For: *Marginulina elongata* d'Orbigny, 1840, *pro parte*, Mém, Soc. géol. France, vol. 4, No. 1, p. 17, pl. 1, fig. 22 (non 20, 21).

ENANTIOMORPHINA gen. nov. Marie, *ibid.*, vol. 12, fasc. 1, p. 144. Family Enantiomorphinidae Marie, 1941, *ut infra*. Genotype: *Enantiomorphina lemoinei* Marie, 1941, *ut infra*. Upper Cretaceous.
——— *cayeuxi* Marie, *ibid.*, vol. 12, fasc. 1, p. 148, pl. 18, fig. 201. Senonian, Paris Basin, France.
——— *jacobi* Marie, *ibid.*, vol. 12, fasc. 1, p. 148, pl. 18, fig. 203. Senonian, Paris Basin, France.
——— *lemoinei* Marie, *ibid.*, vol. 12, fasc. 1, p. 145, pl. 18, figs. 197–200, 202. Senonian, Paris Basin, France.
——— ——— ——— var. *conica* Marie, *ibid.* vol. 12, fasc. 1, p. 146, pl. 18, fig. 198. Senonian, Paris Basin, France.
——— ——— ——— var. *elongata* Marie, *ibid.*, vol. 12, fasc. 1, p. 147, pl. 18, fig. 202. Senonian, Paris Basin, France.
——— ——— ——— var. *inflata* Marie, *ibid.*, vol. 12, fasc. 1, p. 147, pl. 18, figs. 199, 200. Senonian, Paris Basin, France.

ENANTIOMORPHINIDAE fam. nov. Marie, *ibid.*, vol. 12, fasc. 1, p. 142. Includes the above listed new genera: *Enantiomorphina, Enantiodentalina, Enantiovaginulina* Marie, 1941, *ut infra, Enantiocristellaria, Enantiomarginulina*, and the two genera *Svenia* and *Polymorphinella*

ENANTIOVAGINULINA gen. nov. Marie, *ibid.*, vol. 12, fasc. 1, p. 160. Family Enantiomorphinidae Marie, 1941, *ut supra*. Genotype: *Cristellaria recta* d'Orbigny, 1840, Mém, Soc. géol. France, vol. 4, No. 1, p. 28, pl. 2, figs. 23–25. Upper Cretaceous.

Eouvigerina aspera (Marsson, 1878) var. *denticulocarinata* Marie, *ibid.*, vol. 12, fasc. 1, p. 193, pl. 29, fig. 285. Senonian, Paris Basin, France. New name for: *Sagrina aspera* Marsson, 1878, Mitt, Naturwiss. Ver. Neu-Vorpommern u. Rügen, vol. 10, p. 157, pl. 3, figs. 26 a–d only.
——— ——— (———) var. *inflata* Marie, *ibid.*, vol. 12, fasc. 1, p. 195, pl. 29, figs. 288, 289. Senonian, Paris Basin, France. New name for: *Sagrina aspera* Egger, 1899, (non Marsson 1878), Abhandl. k. Bayer. Akad. Wiss. München, Cl. II, vol. 21, p. 134, pl. 15, figs. 11, 12, 57.
——— ——— (———) var. *laevigata* Marie *ibid.*, vol. 12, fasc. 1, p. 193, pl. 29, fig. 284. Senonian, Paris Basin, France.

Eponides biconvexa Marie, *ibid.*, vol. 12, fasc. 1, p. 224, pl. 34, fig. 324. Senonian, Paris Basin, France.
——— *monterelensis* Marie, *ibid.*, vol. 12, fasc. 1, p. 224, pl. 34, fig. 325. Senonian, Paris Basin, France.
——— *tschoppi* van Bellen, Proc. Nederl Akad. Wetensch., vol. 44, p. 1143, pl. figs. 10–12. Lower Oligocene, Cuba.

Eulepidina see *Lepidocyclina*.

Faujasina subrotunda ten Dam and Reinhold, Mededeel. Geol. Sticht. Haarlem, (C), vol. 5, No. 1, p. 53, pl. 4, fig. 13; pl. 6, fig. 10. Middle Pliocene, Holland.

Flabellina pavoninoides Marie, Mém. Mus. Nation. Hist. Nat. Paris, n.s., vol. 12, fasc. 1, p. 141, pl. 17, fig. 196. Senonian, Paris Basin, France. (Note: This form should be allocated to the genus *Palmula*.)
——— *vertebralis* Marie, *ibid.*, vol. 12, fasc. 1, p. 139, pl. 13, fig. 161. Senonian, Paris Basin, France. (Note: belongs to the genus *Palmula*.)

Frankeina beisseli nom. nov. Marie, *ibid.*, vol. 12, fasc. 1, p. 23, pl. 2, fig. 12. Senonian, Paris Basin, France. New name for: *Haplophragmium murchisoni* Beissel, 1891, Abhandl.

Preuss. Landes-Anstalt Berlin, p. 15, pl. 4, figs. 1–10.

Frondicularia bicornis Reuss, 1845, var. *etiola* Marie, *ibid.*, vol. 12, fasc. 1, p. 129, pl. 15, fig. 185. Senonian, Paris Basin, France.

——— ——— ——— var. *rhomboidalis* Marie, *ibid.*, vol. 12, fasc. 1. p. 129, pl. 15, fig. 184. Senonian, Paris Basin, France. [Note: The varietal name is preoccupied by a) *Frondicularia rhomboidalis* d'Orbigny, 1826, Ann. Sci. Nat. (1), vol. 7, p. 256; Modèles No. 3; and b) *Frondicularia rhomboidalis* Terquem, 1862, Mém. Acad. Imp. Metz., vol. 42, (2), No. 9, p. 439, pl. 5, fig. 19.]

——— *incrassata* Marie, *ibid.*, vol. 12, fasc. 1, p. 130, pl. 15, fig. 186. Senonian, Paris Basin, France.

——— *laevis* Marsson, 1878, var. *inflata* Marie, *ibid.*, vol. 12, fasc. 1, p. 116, pl. 14, fig. 163. Senonian, Paris Basin, France.

——— *montelerensis* Marie, *ibid.*, vol. 12, fasc. 1, p. 132, pl. 16, fig. 189. Senonian, Paris Basin, France.

——— *ogivalis* Marie, *ibid.*, vol. 12, fasc. 1, p. 125, pl. 15, figs. 178, 179. Senonian, Paris Basin, France.

——— *ortocarena* Marie, *ibid.*, vol. 12, fasc. 1, p. 120, pl. 14, figs. 171, 172. Senonian, Paris Basin, France.

——— *pedicellaris* Marie, *ibid.*, vol. 12, fasc. 1, p. 126, pl. 15, fig. 181. Senonian Paris Basin, France.

——— *pedunculata* Marie, *ibid.*, vol. 12, fasc. 1, p. 125, pl. 15, fig. 180. Senonian, Paris Basin, France.

——— *recta* Marie, ibid., vol. 12, fasc. 1, p. 119, pl. 14, fig. 168. Senonian, Paris Basin, France. For: *Frondicularia angulata* Reuss, 1846, Verstein. Böhm. Kreideformat., pt. I, p. 31, pl. 13, fig. 40; pt. II, p. 107, pl. 24, fig. 42; and for: *Frondicularia angulosa* Franke, 1928, Abhandl. Preuss. geol. Landes-Anst., p. 71, pl. 6, fig. 13.

——— *retrogradata* Marie, *ibid.*, vol. 12, fasc. 1, p. 124, pl. 14, fig. 177. Senonian, Paris Basin, France.

——— *sagittula* Marie, *ibid.*, vol. 12, fasc. 1, p. 117, pl. 14, fig. 164. Senonian, Paris Basin, France. (Note: The species name is preoccupied by *Frondicularia alata* d'Orbigny, 1826, var. *sagittula* van den Broeck, 1876, Ann. Soc. Belge Microscop., vol. 2, p. 113, pl. 2, figs. 12, 14.)

——— *sepiolaris* Marie, *ibid.*, vol. 12, fasc. 1, p. 131, pl. 15, fig. 187; pl. 16, fig. 188. Senonian, Paris Basin, France. [Note: Fig. 188 is according to Marie, the forma *typica*, which should not be confused with *Frondicularia typica* Costa, 1855 (1857), Mem. R. Accad. Sci. Napoli, vol. 2, p. 372, pl. 3, fig. 5.

——— ——— ——— var. *laevigata* Marie, *ibid.*, vol. 12, fasc. 1, p. 132, pl. 15, fig. 187. Senonian, Paris Basin, France. [Note: The varietal name is preoccupied by a) *Frondicularia laevigata* d'Orbigny, 1826, Ann. Sci. Nat., vol. 7, p. 256, No. 7; and b) *Frondicularia laevigata* Karrer, 1868, Sitzber. k. k. Akad. Wiss. Wien, vol. 58, pt. 1, p. 167, pl. 4, fig. 3.]

——— *tristriata* Marie, *ibid.*, vol. 12, fasc. 1, p. 120, pl. 14, figs. 169, 170. Senonian, Paris Basin, France.

Gaudryina eocaenica van Bellen, Proc. Nederl. Akad. Wetensch., vol. 44, p. 997, pl. fig. 2. Eocene, Dalmatia, Yugoslavia.

——— *gradata* Berthelin, 1880, var. *crassa* Marie, Mém. Mus. Nation. Hist. Nat. Paris, n.s., vol. 12, fasc. 1, p. 66, pl. 3, fig. 29. Senonian, Paris Basin, France. [Note: The varietal name is preoccupied by a) *Gaudryina crassa* Karrer, 1870, Jahrb.k.k. geol. Reichs- Anst. Wein, vol. 20, p. 166, pl. 1 (10), fig. 4; b) *Gaudryina crassa* Marsson, 1878, Mitth. Naturwiss. Ver. Neu-Vorpommern u. Rügen, vol. 10, p. 158, pl. 3, fig. 17 (error for 27).]

——— aff. *gradata* Berthelin, 1880, var. *gracilis* Marie *ibid.*, vol. 12, fasc. 1, p. 66, pl. 3, fig. 28. Senonian, Paris Basin, France. [Note: This variety is preoccupied by *Gaudryina gracilis* Cushman and Laiming, 1931, Jour. Paleontology, vol. 5, p. 95, pl. 10, fig. 1.]

Gaudryinella elongata Marie, *ibid.*, vol. 12, fasc. 1, p. 71, pl. 8, fig. 76. Senonian, Paris Basin, France.

——— *ovoidea* Marie, *ibid.*, vol. 12, fasc. 1, p. 70, pl. 8, fig. 75. Senonian, Paris Basin, France.

Glandulina ornata Marie, *ibid.*, vol. 12, fasc. 1, p. 177, pl. 27, fig. 260. Senonian, Paris Basin, France.

Globotruncana linnei (d'Orbigny, 1839) var. *bulloides* Vogler, Palaeontogr., Suppl. -Bd. 4, (4), Lief. 4, p. 287, pl. 23, figs. 32–39. Upper Cretaceous, Misol, Netherlands East Indies. New name for: *Rosalina linnei* type 3 of de Lapparent, 1918, Terr. Crét. Hendaye, Mém. Explicat. Carte géol. France, p. 7, text figs. 1-h, 2-e. [Note: Marie, 1941, Mém. Mus. Nation. Hist. Nat. Paris, n.s., vol. 12, fasc. 1, p. 230 proposes for the same type 3 of de Lapparent, 1918, the name: *Rosalinella globigerinoides, ut infra.*]

——— ——— (———) var. *stuarti* Vogler, *ibid.*, Suppl. -Bd. 4, (4), Lief. 4, p. 289, pl. 24, figs. 8–13. Upper Cretaceous, Misol, Netherlands East Indies. [Note: The varietal name is preoccupied by *Rosalina* (*Globotruncana*) *stuarti* de Lapparent, 1918, Terr. Crét, Hendaye, Mém. Explicat. Carte géol. France, p. 14, pl. 1, figs. 5–7; text figs. 5a–c.]

Gümbelina complanata Marie, Mém. Mus. Nation. Hist. Nat. Paris, n.s., vol. 12, fasc. 1, p. 184, pl. 28, fig. 276. Senonian, Paris Basin, France.

——— *globulosa* (Ehrenberg, 1838) var. *striatula* Marie, *ibid.*, vol. 12, fasc. 1, p. 182, pl. 28, figs. 273–275. Senonian, Paris Basin, France. For: *Textilaria globulosa* Ehrenberg, 1838, Abhandl. k. Preuss. Akad. Berlin, p. 135, pl. 4, fig. 4-b; same species in Ehrenberg, 1854, Mikrogeol., pl. 21, fig. 87; same species in Reuss, 1845–46, Verst. Böhm. Kreide, p. 39, pl. 12, fig. 23; for: *Gümbelina striata* Cushman, 1938 (non Ehrenberg, 1838), Contr. Cushman Lab. Foram. Res. vol. 14, p. 8, pl. 1, figs. 39 a, b; for: *Gümbelina, reussi* Cushman, 1938, *loc. cit.* vol. 14, p. 11, pl. 2, fig. 7; and for: *Textilaria globifera* Reuss, 1860, Sitzber. k.k. Akad. Wiss. Wien, vol. 40, p. 232, pl. 13, fig. 7 (?)).

GYROMORPHINA gen. nov. Marie, *ibid.*, vol. 12, fasc. 1, p. 230. Fam. Chilostomellidae. Genotype: *Valvulina allomorphinoides* Reuss, 1860, Sitzber. k. Akad. Wiss. Wien, Math. -nat. Kl., vol. 40, p. 223, pl. 11, fig. 6. Upper Cretaceous. [Note: *cave Gyromorphus* Guillebeau, 1894 (Coleopt.).]

——— *monterelensis* Marie, *ibid.*, vol. 12, fasc. 1, p. 231, pl. 35, fig. 332. Senonian, Paris Basin, France.

Hagenowella courta Marie, *ibid.* vol. 12, fasc. 1, p. 43, pl. 7, fig. 68. Senonian, Paris Basin, France.

Heterostomella helicoidalis Marie, *ibid.*, vol. 12, fasc. 1, p. 69, pl. 3, fig. 33. Senonian, Paris Basin, France.

——— *laevigata* Marie, *ibid.*, vol. 12, fasc. 1, p. 69, pl. 3, fig. 32. Senonian, Paris Basin, France.

Hippocrepina vertebralis Marie, *ibid.*, vol. 12, fasc. 1, p. 15, pl. 1, figs. 1–4. Senonian, Paris Basin, France.

Lagena amphora Reuss, 1863, var. *cylindrica* Marie, *ibid.*, vol. 12, fasc. 1, p. 75, pl. 9, fig. 84 Senonian, Paris Basin, France. [Note: The varietal name is preoccupied by *Lagena cylindrica* Smith, 1915, Ann. Mag. Nat. Hist., (8), vol. 15, p. 306, pl. 13, fig. 3/8-a.]

——— *apiculata* (Reuss, 1850), var. *mucronina* Marie, *ibid.*, vol. 12, fasc. 1, p. 80, pl. 9, figs. 96, 97. Senonian, Paris Basin, France.

——— ——— (———) var. *obliqua* Marie, *ibid.*, vol. 12, fasc. 1, p. 81, pl. 9, fig. 99. Senonian, Paris Basin, France.

——— ——— (———) var. *ovoidea* Marie, *ibid.*, vol. 12, fasc. 1, p. 81, pl. 9, fig. 98. Senonian, Paris Basin, France. [Note: Preoccupied by *Lagena hispida* Reuss, 1858, var. *ovoidea* Marie, 1941, *ut infra*.].

——— *cayeuxi* Marie, *ibid.*, vol. 12, fasc. 1, p. 74, pl. 9, figs. 82, 83. Senonian, Paris Basin, France.

——— *hexagona* (Williamson, 1848) var. *apicicostata* ten Dam and Reinhold, Mededeel. Geol. Sticht. Haarlem, (C) vol. 5, No. 1, p. 47, pl. 6, fig. 6.; pl. 2, fig. 6. Middle Pliocene, Scaldisian, Holland.

——— *hispida* Reuss, 1858, var. *ovoidea* Marie, Mém. Mus. Nation. Hist. Nat. Paris, n.s., vol. 12, fasc. 1, p. 77, pl. 9, fig. 91. Senonian, Paris Basin, France.

——— ——— ——— var. *subsphaerica* Marie, *ibid.*, vol. 12, fasc. 1, p. 77, pl. 9, fig 90. Senonian, Paris Basin, France.

——— *hyugaensis* Oinomikado, Jour. Geol. Soc. Japan, vol. 48, No. 578, p. 518, text fig. 2. Pliocene, Japan.

——— *jacobi* Marie, Mém. Mus. Nation. Hist. Nat. Paris, n.s., vol. 12, fasc. 1, p. 78, pl. 9, figs. 87, 88. Senonian, Paris Basin, France.

——— *octogona* Marie, *ibid.*, vol. 12, fasc. 1, p. 78, pl. 9, fig. 93. Senonian, Paris Basin, France.

——— *ovum* (Ehrenberg, 1843) var. *mucronata* Marie, *ibid.*, vol. 12, fasc. 1, p. 79, pl. 9, fig. 95 Senonian, Paris Basin, France. [Note: The varietal name is preoccupied by a) *Lagena mucronata* Terquem and Berthelin, 1875, Mém. Soc. géol. France, (2), vol. 10, Nr. 3, p. 14, pl. 1, fig. 8; and b) *Lagena striata* (Walker and Jacob, 1784) var. *mucronata* Alcock, 1866, Proc. Lit. Philos. Soc. Manchester, vol. 5, p. 99.]

——— *raricosta* (d'Orbigny, 1839) var. *gracilina* Marie, *ibid.*, vol. 12, fasc. 1, p. 75, pl. 9, fig. 85. Senonian, Paris Basin, France. [Note: *cave Lagena* (*Amphorina*) *gracillima* Seguenza, 1862.]

——— *sphaerica* Marie, *ibid.*, vol. 12, fasc. 1, p. 81, pl. 9, fig. 100. Senonian, Paris Basin, France.

——— *squamosa* (Montagu, 1803) var. *apiciglabra* ten Dam and Reinhold, Mededeel. Geol. Stichting Haarlem, (c), vol. 5, No. 1, p. 48, pl. 2, fig. 11; pl. 6, fig. 5. Middle and Upper Pliocene, Holland.

——— *striatocarinata* Marie, Mem. Mus. Nation Hist. Nat. Paris, n.s., vol. 12, fasc. 1, p. 79, pl. 9, fig. 94. Senonian, Paris Basin, France.

Lenticulina frankei Marie, *ibid.*, vol. 12, fasc. 1, p. 100, pl. 9, fig. 105. Senonian, Paris Basin, France. For: *Cristellaria rotulata* Franke, 1928 (non Lamarck, 1804), Abhandl. Preuss. geol. Landes-Anst. Berlin p. 108, pl. 10, fig. 2.

——— *incrassata* Mar[illegible] *ibid.*, vol. 12, fasc. 1, p. 102, pl. 10, fig. 108. Senonian, Paris Basin, France. [Preoccupied by *Lenticulina* (*Nautilus*) *incrassata* (Fichtel and Moll, 1798) Test. Micro., p. 38, pl. 4, figs. a–c. *Cave Cristellaria incrassata* Ehrenberg, 1854.]

——— *polygonalis* Marie, *ibid.*, vol. 12, fasc. 1, p. 102, pl. 10, fig. 107. Senonian, Paris Basin, France [Note: *Cave Cristellaria* (*Lenticulina*) *polygonata* Franke, 1936.]

——— *pseudovalis* Marie, *ibid.*, vol. 12, fasc. 1, p. 99, pl. 9, fig. 102. Senonian, Paris Basin, France.

——— *pseudovortex* Marie, *ibid.*, vol. 12, fasc. 1, p. 103, pl. 10, fig. 109. Senonian, Paris Basin, France.

Lenticulina see also *Cristellaria*.

Lepidocyclina (*Eulepidina*) *formosoides* H. Douville, 1925, var. *asimmetrica* Marchesini, Giorn. Geol. Bologna, vol. 15, p. 56. Onomatype. Oligocene, Italy.

——— (*Nephrolepidina*) *tournoueri* Lemoine and R. Douvillé, 1904, var. *umbonata* Marchesini, *ibid.*, vol. 15, p. 67, pl. 4, figs. 4–6, 8, 9. Miocene, Italy. New name for: *Lepidocyclina* (*Miolepidocyclina*) *negrii* Ferrero, 1909, Boll. Soc. geol. Italiana, vol. 28, p. 135, pl. 3, fig. 6. only; and for: *Nephrolepidina tournoueri* Gomez Llueca, 1929 (non Lemoine and R. Douville, 1904), Com. Invest. Paleont. y Prehist. Madrid, Mem., vol. 36, p. 352, pl. 33, figs. 1 and 2 only.

Lepidorbitoides paronai (A. Silvestri, 1907) var. *asimmetrica* Marchesini, Atti Soc. Toscana Sci. Nat., Mem. 49, p. 167, pl. 4, figs. 25, 26. Maestrichtian, Italy.

——— ——— (———) var. *inermis* Marchesini, *ibid.*, Mem. 49, p. 168. Onomatype. Maestrichtian, Italy.

Lingulina hybrida Frentzen, Beitr. Naturkundl.

Forschg. Oberrheingebiet, vol. 6, p. 329, pl. 3, fig. 14. Liassic, Germany.

——— *miserabilis* Frentzen, *ibid.*, vol. 6, p. 330, pl. 3, figs. 12, 13. Liassic, Germany.

Marginopora (*Amphisorus*) *hemprichi* (Ehrenberg, 1838) var. *planata* Lacroix, Bull. Inst. Oceanogr. Monaco, No. 794, p. 32. Onomatype. Recent, Red Sea.

——— (———) ——— (———) var. *subplicata* Lacroix, *ibid*, Nr. 794, p. 32. Onomatype. Red Sea, Recent. For: *Orbitolites complanata* auctorum, partim (nec Lamarck, 1801). (Note: The variety is called "*subduplicata*" on the table opposite p. 32, Type III).

Marginulina aequilateralis Marie, Mém. Mus. Nation. Hist. Nat. Paris, n.s., vol. 12, fasc. 1, p. 108, pl. 13, fig. 157. Senonian, Paris Basin, France.

——— *burgundiae* Terquem, 1864, subspec. *dentaliniformis* Frentzen, Beitr. naturkundl. Forschg. Oberrheingebiet, vol. 6, p. 334, pl. 3, figs. 35–37. Liassic, Germany. (Note: The varietal name is preoccupied by *Marginulina dentaliniformis* Mariani, 1888, Atti Soc. Ital. Sci., vol. 30, p. 113, pl. 1, fig. 45.)

——— *orbignyi* Marie, Mém. Mus. Nation. Hist. Nat. Paris., n.s., vol. 12, fasc. 1, p. 107, pl. 13, fig. 155. Senonian, Paris Basin, France. (Note: *cave Marginulina orbignyana* Neugeboren, 1851.)

——— *ovalis* Marie, *ibid.*, vol. 12, fasc. 1, p. 107, pl. 13, fig. 154. Senonian, Paris Basin, France.

——— *ovoidea* Marie, *ibid.*, vol. 12, fasc. 1, p. 107, pl. 13, fig. 156. Senonian, Paris Basin, France.

Nephrolepidina see *Lepidocyclina*.

Nodosaria aciformis Frentzen, Beitr. naturkundl. Forsch. Oberrheingebiet, vol. 6, p. 315, pl. 2, fig. 8. Liassic, Germany.

——— *alemannica* Frentzen, *ibid.*, vol. 6, p. 315, pl. 2, fig. 7. Liassic, Germany.

——— *annulifera* Frentzen, *ibid.*, vol. 6, p. 316, pl. 2, figs. 20, 21. Middle Jurassic (Dogger), Germany. [Note: This species is preoccupied by *Nodosaria annulifera* Gümbel. 1868 (1870), Abhandl. math. -phys. Kl. Bayer. Akad. Wiss. München, vol. 10, p. 614, pl. 1, fig. 21.]

——— *aselfingensis* Frentzen, *ibid.*, vol. 6, p. 316, pl. 2, figs. 9–11. Liassic, Germany.

——— *bilobata* Marie, Mém. Mus. Nation. Hist. Nat. Paris, n.s., vol. 12, fasc. 1, p. 83, pl. 11, fig. 117. Senonian, Paris Basin, France.

——— *caudata* Frentzen, Beitr. naturkundl. Forsch. Oberrheingebiet, vol. 6, p. 317, pl. 2, fig. 22. Liassic, Germany. [Note: Preoccupied by *Nodosaria* (*Vaginulina*) *caudata* d'Orbigny, 1826, Ann. Sci. Nat. vol. 7, p. 258, No. 8, *teste* Parker, Jones, and Brady, 1871, Ann. Mag. Nat. Hist., (4), vol. 8, p. 163, pl. 9, fig. 60.]

——— *eggeri nom. nov.* Marie, Mém. Mus. Nation. Hist. Nat. Paris, n.s., vol. 12, fasc. 1, p. 85, pl. 11, fig. 123. Senonian, Paris Basin, France. New name for: *Nodosaria prismatica* Egger, 1899, Abhandl. k. Bayer. Akad. Wiss. München, Cl. II, vol. 21, p. 77, pl. 8, figs. 5–8.

——— *hemimorpha* Frentzen, Beitr. naturkundl. Forsch. Oberrheingebiet, vol. 6, p. 318, pl. 2, figs. 29–31. Liassic, Germany.

——— *histrix* Marie, Mém. Mus. Nation. Hist. Nat. Paris., n.s., vol. 12, fasc. 1, p. 86, pl. 11, fig. 124. Senonian, Paris Basin, France.

——— *laevigata* Frentzen, Beitr. naturkundl. Forsch. Oberrheingebiet, vol. 6, p. 319, pl. 2, figs. 26, 27. Liassic, Germany. [Note: Preoccupied by *Nodosaria* (*Glandulina*) *laevigata* d'Orbigny, 1826, Ann. Sci. Nat. vol. 7, p. 252, No. 1, pl. 10, figs. 1–3; and by: *Nodosaria laevigata* Nilsson, 1826, K. Vet. Akad. Handl., p. 342, figured in Nilsson, 1827, Petrif. Suecana, p. 8, pl. 9, fig. 20.]

——— *misolensis* Vogler, Palaeontogr., Suppl. -Bd. 4, (4), Lief. 4, p. 284, pl. 22, figs. 13–16. Upper Cretaceous, Misol. Netherlands East Indies.

——— *obliquecostata* Frentzen, Beitr. naturkundl. Forsch. Oberrheingebiet, vol. 6, p. 320, pl. 2, fig. 24. Liassic, Germany. [Note: Preoccupied by *Nodosaria obliquecostata* Stache, 1864, Novara-Exped., Geol., (1), p. 197, pl. 22, fig. 24.]

——— *perlata* Frentzen, *ibid.*, vol. 6, p. 321, pl. 2, fig. 23. Liassic, Germany.

——— *pseudodissleri* Frentzen, *ibid.*, vol. 6, p. 322, pl. 2, figs. 5, 6. Liassic, Germany.

——— *ramuliformis* Marie, Mém. Mus. Nation. Hist. Nat. Paris, n.s., vol. 12, fasc. 1, p. 87, pl. 11, fig. 126. Senonian, Paris Basin, France.

——— *torulosi* Frentzen, Beitr. naturkundl. Forsch. Oberrheingebiet, vol. 6, p. 324, pl. 2, fig. 25. Middle Jurassic (Dogger), Germany.

Nonion graciosa ten Dam and Reinhold. Mededeel. Geol. Stichting Haarlem, (C), vol. 5, No. 1, p. 52, pl. 3, fig. 7; pl. 6, fig. 8. Pliocene, Holland.

——— *granulosus* ten Dam and Reinhold, Geol. en Mijnbouw, vol. 3, p. 211, text figs. 1, 2. Upper Oligocene, Holland.

Nubecularia macrocephali Frentzen, Beitr. naturkundl. Forsch, Oberrheingebiet, vol. 6, p. 358, pl. 6, figs. 2, 3. Middle Jurassic (Dogger), Germany.

Orbignyna ovata Hagenow, 1842, var. *conica* Marie, Mém. Mus. Nation. Hist. Nat. Paris, n.s., vol. 12, fasc. 1, p. 25, pl. 1, fig. 10. Senonian, Paris Basin, France.

Placopsilina eichbergensis Frentzen, Beitr. naturkundl. Forsch, Oberrheingebiet, vol. 6, p. 310, pl. 2, fig. 4. Middle Jurassic (Dogger), Germany.

Planularia brandsi de Witt Puyt, Proc. Nederl. Akad. Wetensch., vol. 44, p. 1141, pl. fig. 37. Lower Oligocene, Cuba.

——— *thiadensi* de Witt Puyt, *ibid.*, vol. 44, p. 1142, pl. fig. 38, Lower Oligocene, Cuba. For: *Planularia sp.* Thiadens, 1937, Jour. Paleontology, vol. 11, p. 94, pl. 16, figs. 2, 3.

Planularia see also *Cristellaria*.

Planulina palmerae van Bellen, 'Proc. Nederl. Akad. Wetensch,. vol. 44, p. 1144, pl. figs. 7–9. Lower Oligocene, Cuba. For: *Planulina marie-*

lana Palmer and Bermudez, 1936 (non Hadley, 1934), Mem. Soc. Cubana Hist. Nat., vol. 10, p. 313, pl. 20, figs. 10–12.

Plectina sphaerica van Bellen, *ibid.*, vol. 44, p. 997, pl. fig. 3, Eocene, Dalmatia, Yugoslavia.

Polymorphinella lemoinei Marie, Mém. Mus. Nation. Hist. Nat. Paris, n.s., vol. 12, fasc. 1, p. 162, pl. 21, fig. 234. Senonian, Paris Basin, France.

Psammophax liasina Frentzen, Beitr. naturkundl. Forsch, Oberrheingebiet, vol. 6, p. 300, pl. 1, fig. 1, Liassic, Germany

Pseudoclavulina liebusi nom. nov. Montagne, Thesis Univ. Utrecht, p. 50, pl. 6, figs. 13, 14. Eocene, Dalmatia, Yugoslavia. New name for: *?Clavulina parisiensis* Schwager, 1883, Palaeontogr., vol. 30, p. 116, pl. 3, fig. 16; and for: *Clavulina parisiensis* Liebus, 1911 (non d'Orbigny, 1826), Sitzber. k. Akad. Wiss. Wien, Math.-nat. Cl., vol. 120, p. 933, pl. 3, figs. 2–4.

Pseudoglandulina cincta Frentzen, Beitr. naturkundl. Forsch, Oberrheingebiet, vol. 6, p. 326, pl. 3, fig. 4. Liassic, Germany.

——— *rugata* Frentzen, *ibid.*, vol. 6, p. 328, pl. 2, figs. 33–35. Liassic, Germany.

PSEUDOLITUOLA gen. nov. Marie, Mém. Mus. Nation. Hist. Nat. Paris., n.s., vol. 12, fasc. 1, p. 21. Family Lituolidae. No genotype given. Cretaceous.

Pseudotextularia trilocula Marie, *ibid.*, vol. 12, fasc. 1, p. 186, pl. 28, fig. 278. Senonian, Paris Basin, France.

Pullenia sphaeroides (d'Orbigny, 1826) var. *cubensis* de Witt Puyt, Proc. Nederl. Akad. Wetensch., vol. 44, p. 1142, pl. fig. 33. Lower Oligocene, Cuba.

Pulvinulinella cubensis van Bellen, *ibid.*, vol. 44, p. 1144, pl. figs. 25, 26. Lower Oligocene, Cuba.

Pyrulina cylindroides (Roemer, 1838) var. *apiculata* Marie, Mém. Mus. Nation. Hist. Nat. Paris, n.s., vol. 12, fasc. 1, p. 175, pl. 27, figs. 257, 258. Senonian, Paris Basin, France.

PYRULINOIDES gen. nov. Marie, *ibid.*, vol. 12, fasc. 1, p. 169. Family Polymorphinidae. Genotype: *Pyrulina acuminata* d'Orbigny, 1840, Mém. Soc. géol. France, vol. 4, No. 1, p. 43, pl. 4, figs. 18, 19. Upper Cretaceous.

——— *acuminata* (d'Orbigny, 1840) var. *crassa* Marie, *ibid.*, vol. 12, fasc. 1, p. 171, pl. 24, fig. 247; pl. 25, figs. 248, 249. Senonian, Paris Basin, France.

——— ——— (———) var. *nana* Marie, *ibid.*, vol. 12, fasc. 1, p. 171, pl. 25, fig. 250. Senonian, Paris Basin, France.

——— *elliptica* Marie, *ibid.*, vol. 12, fasc. 1, p. 172, pl. 26, figs. 251, 252. Senonian, Paris Basin, France.

——— *obesa* Marie, *ibid.*, vol. 12, fasc. 1, p. 172, pl. 26, fig. 253. Senonian, Paris Basin, France.

——— *ovalis* Marie, *ibid.*, vol. 12, fasc. 1, p. 173, pl. 26, fig. 254. Senonian Paris Basin, France.

——— *pseudogutta* Marie, ibid., vol. 12, fasc. 1, p. 173, pl. 26, fig. 255. Senonian, Paris Basin, France.

Quadrulina anatififormis Marie, *ibid.*, vol. 12, fasc. 1, p. 166, pl. 22, fig. 236. Senonian, Paris Basin, France.

? Quadrulina virgulinoides Marie, *ibid.*, vol. 12, fasc. 1, p. 167, pl. 22, fig. 237. Senonian, Paris Basin, France

ROGLIČIA gen. nov. van Bellen, Proc. Nederl. Akad. Wetensch., vol. 44, p. 1000. Family Ceratobuliminidae. Genotype: *Rogličia sphaerica* von Bellen, 1941, *ut infra*. Eocene.

——— *sphaerica* van Bellen, *ibid.*, vol. 44, p. 1000, pl. fig. 21. Eocene, Dalmatia, Yugoslavia.

ROSALINELLA gen. nov. Marie, Mém. Mus. Nation. Hist. Nat. Paris, n.s., vol. 12, fasc. 1, p. 237. Family Globorotaliidae. Genotype: *Rosalina linneiana* d'Orbigny, 1839, in de la Sagra, Hist. Phys. Nat. Cuba, vol. 8, Foraminifères, p. 101, pl. 5, figs. 10–12. Upper Cretaceous. (Note: This new genus, apparently, is a synonym of *Globotruncana* Cushman, 1927.)

——— *globigerinoides* nom. nov. Marie, *ibid.*, vol. 12, fasc. 1, p. 230, pl. 36, figs. 338, 339. Senonian, Paris Basin, France. New name for: *Rosalina linnei* type III, de Lapparent, 1918, Mém. Explicat. Carte Géol. France, Hendaye, p. 7, text figs. 1-h, and 2-e. [Note: Vogler, 1941, refers to the same figures for his new variety *Globotruncana linnei* (d'Orbigny) var. *bulloides ut supra*. If *Rosalinella* Marie, indeed, becomes a synonym of *Globotruncana* Cushman, then *Rosalinella globigerinoides* Marie will be a homonym of *Globotruncana globigerinoides* Brotzen, 1936.]

——— ——— var. *sublaevigata* Marie, *ibid.*, vol. 12, fasc. 1, p. 240, pl. 36, fig. 339. Senonian, Paris Basin, France.

——— *lapparenti* Marie, *ibid.*, vol. 12, fasc. 1, p. 241, pl. 36, fig. 341. Senonian, Paris Basin, France. (Note: If *Rosalinella* Marie becomes a synonym of *Globotruncana* Cushman, then this new species will be homonymous of *Globotruncana lapparenti* Brotzen, 1936.)

——— *rugosa* Marie, *ibid.*, vol. 12, fasc. 1, p. 240, pl. 36, fig. 340. Senonian, Paris Basin, France.

Rotalia beccarii (Linnaeus, 1758) var. *icenica* ten Dam and Reinhold, Mededeel. Geol. Stichting Haarlem, (C), vol. 5, No. 1, p. 58, pl. 4, fig. 8. Lower Pleistocene, Holland.

——— ——— (———) var. *pliocenica* ten Dam and Reinhold, *ibid.*, vol. 5, No. 1, p. 59, pl. 4, figs. 7, 9. Upper Pliocene, Holland.

——— *cubensis* van Bellen, Proc. Nederl. Akad. Wetensch., vol. 44, p. 1143, pl. figs. 13–15. Lower Oligocene, Cuba.

——— *serrata* ten Dam and Reinhold, Mededeel. Geol. Stichting, Haarlem, (C), vol. 5, No. 1, p. 59, pl. 4, fig. 10; pl. 6, fig. 4. Middle and Upper Pliocene, Holland. For: *Rotalia calcar* Jones, Parker and Brady, 1866 (non d'Orbigny 1826), Foram. Crag., p. 333, pl. 2, fig. 69.

Saracenaria meudonensis Marie, Mém. Mus. Nation. Hist. Nat. Paris., n.s., vol. 12, fasc. 1, p. 112, pl. 10, fig. 116. Senonian, Paris Basin, France.

——— *pseudonavicula* Marie, *ibid.*, vol. 12, fasc. 1, p. 110, pl. 10, figs. 113, 114. Senonian, Paris Basin, France.

SEPTIGERINA gen. nov. F. G. Keijzer. Proc. Nederl. Akad. Wetensch. vol. 44, p. 1006. Family Textulariidae. Genotype: *Septigerina dalmatina* F. G. Keijzer, *ut infra*. Middle Eocene.

——— *dalmatina* F. G. Keijzer, *ibid.*, vol. 44, p. 1006, text figs. 1–4. Middle Eocene, Dalmatia. Yugoslavia. For: *Textularia an Spiroplecta sp. nov.* Liebus, 1911, Sitzber. k. Akad. Wiss. Wien, Math.-nat. Kl., vol. 120, p. 932, pl. 2, fig. 6.

Sorites variabilis Lacroix 1940, var. *affixa* Lacroix, Bull. Inst. Océanogr. Monaco, No. 794, p. 31. Onomatype. Recent. Red Sea.

——— ——— ——— var. *variabilis* Lacroix, *ibid.*, No. 794, p. 31, type II. Recent, Red Sea. (Note: Both new varieties are described but no type figures are designated; moreover, the variety "*variabilis*" becomes a homonym of *Sorites variabilis* Lacroix 1940.)

Siphonina cubensis van Bellen, Proc. Nederl. Akad. Wetensch., vol. 44, p. 1144, pl. figs. 1–3. Lower Oligocene, Cuba.

Spirocyclina casterasi Bonte, Bull. Serv. Carte géol. France, No. 205, vol. 42, p. 108 (publication not seen). Jurassic, Bathonian, Ardennes, France. [Note: The same author has subsequently placed this form into synonymy with *Orbitammina elliptica* (d'Archiac, 1843) in Bull. Soc. géol. France, (5), vol. 12, 1942, p. 331, pl. 9, fig. 1–7; text figs. 1–3.]

Stomiosphaera aculeata Vogler, Palaeontogr., Suppl.-Bd. 4, (4), Lief. 4, p. 284, pl. 21, figs. 66, 69. Neocomian, Misol, Netherlands East Indies.

——— *polygona* Vogler, *ibid.*, Suppl.-Bd. 4, (4), Lief. 4, p. 283, pl. 21, fig. 61. Neocomian, Misol, Netherlands East Indies.

——— *spinosa* Vogler, *ibid.*, Suppl.-Bd. 4, (4), Lief. 4, p. 284, pl. 21, figs. 60, 65. Aptian, Misol, Netherlands East Indies.

Streblus subtrispinosus Ishizaki, Taiwan Tigaku Kizi, vol. 12, p. 63, pl. 6, figs. 1–4. Neogene, Formosa, Japan.

Svenia debilis Marie, Mém. Mus. Nation. Hist. Nat. Paris, n.s., vol. 12, fasc. 1, p. 158, pl. 20, fig. 227. Senonian, Paris Basin, France.

——— *recta* Marie, *ibid.*, vol. 12, fasc. 1, p. 157, pl. 20, fig. 224. Senonian, Paris Basin, France.

Textularia conoidea Marie, *ibid.*, vol. 12, fasc. 1, p. 63, pl. 2, fig. 20. Senonian, Paris Basin, France. (Note: *cave Textularia conuloidea* Costa, 1856.)

Tolypammina humphriesi Frentzen, Palaeontogr., Suppl.-Bd. 4, (4), Lief. 4, p. 303, pl. 1, fig. 7. Middle Jurassic (Dogger), Germany.

Tritaxilina laevigata Marie, Mém. Mus. Nation. Hist. Nat. Paris, n.s., vol. 12, fasc. 1, p. 40, pl. 8, figs. 79–81. Senonian, Paris Basin, France.

——— *pentagonalis* Montagne, Thesis Univ. Utrecht, p. 50, pl. 6, figs. 17–19. Eocene, Dalmatia, Yugoslavia. For: *Tritaxilina nov. sp.* van Bellen, 1941, *ut infra*.

——— *polygonalis* Marie, Mém. Mus. Nation. Hist. Nat. Paris, n.s., vol. 12, fasc. 1, p. 39, pl. 8, figs. 77, 78. Senonian, Paris Basin, France.

——— ——— ——— var. *irregularis* Marie, *ibid.*, vol. 12, fasc. 1, p. 40, pl. 8, figs. 87 b–d. Senonian, Paris Basin, France.

Trocholina granosa Frentzen, Beitr. naturkundl. Forsch. Oberrheingebiet, vol. 6, p. 304, pl. 1, fig. 11. Liassic, Germany.

——— *intermedia* Frentzen, *ibid.*, vol. 6, p. 305, pl. 1, fig. 10. Liassic, Germany.

——— *turris* Frentzen, *ibid.*, vol. 6, p. 306, pl. 1, fig. 13. Liassic, Germany.

——— *umbo* Frentzen, *ibid.*, vol. 6, p. 306, pl. 1, fig. 12. Liassic, Germany.

Uvigerina hosiusi ten Dam and Reinhold, Geol. en Mijnbouw, vol. 3, p. 237, pl. 1, figs. 1–3; pl. 2, figs. 1–3. Middle Miocene, Netherlands and northwestern Germany. For: *Uvigerina aculeata* Hosius, 1893 (non d'Orbigny, 1846) Verhandl. Naturforsch. Ver. Rheinlande u. Westfalen, vol. 50, p. 108, pl. 2, figs. 9; and for *Uvigerina* cf. *cocoaensis* Staesche and Hiltermann, 1940 (non Cushman 1925) Abhandl. Reichsst. Bodenforsch. Berlin, n.s., vol. 201, p. 25, pl. 46, fig. 3.

Vaginulina transversarii Frentzen, Beitr. Naturkundl. Forsch. Oberrheingebiet, vol. 6, p. 330, pl. 4, fig. 5. Upper Jurassic (Malm), Germany.

——— *triangula* Frentzen, *ibid.*, vol. 6, p. 340, pl. 4, fig. 8. Liassic, Germany.

Valvulineria wittpuyti van Bellen, Proc. Nederl. Akad. Wetensch., vol. 44, p. 999, pl. fig. 17. Eocene, Dalmatia, Yugoslavia.

Ventilabrella reniformis Marie, Mém. Mus. Nation. Hist. Nat. Paris, n.s., vol. 12, fasc. 1, p. 185, pl. 28, fig. 272. Senonian, Paris Basin, France.

Vulvulina eocaena Montagne, Thesis Univ. Utrecht, p. 44, pl. 6, figs. 3, 4. Eocene, Dalmatia, Yugoslavia. For: *Vulvulina n. sp.* F. G. Keijzer, 1938, Proc. K. Nederl. Akad., Wetensch., vol. 41, p. 987.

FORMS WITH NOMENCLATURA APERTA

Amphisorus sp. 1 No. 84 Marie, Mém. Soc. Linn. Normandie, n.s., vol. 1, fasc. 1, p. 63, text fig. 5. Recent, Red Sea.

——— *sp. 2 No. 84* Marie, *ibid.*, vol. 1, fasc. 1, 1, p. 63, text fig. 8. Recent, Red Sea.

Anomalina sp. van Bellen, Proc. Nederl. Akad. Wetensch., vol. 44, p. 1001, pl. fig. 27. Eocene, Dalmatia.

Bulimina sp. van Bellen, *ibid.*, vol. 44, p. 999, pl. fig. 13. Eocene, Dalmatia.

? Bulimina sp. van Bellen, *ibid.*, vol. 44, p. 999, pl. fig. 14. Eocene, Dalmatia.

Cibicides sp. Montagne, Thesis Univ. Utrecht, p. 55, pl. 6, figs. 42–44. Eocene, Dalmatia.

Dictyoconus sp. Montagne, *ibid.*, p. 61, pl. 7, figs. 3, 7. Eocene, Dalmatia.

Discocyclina nov. sp. Montagne, *ibid.*, p. 60, pl. 7, figs. 2, 12. Eocene, Dalmatia.

Frondicularia sp. Marie, Mém. Mus. Nation. Hist. Nat. Paris, n.s., vol. 12, fasc. 1, p. 128, pl. 15, figs. 183. Senonian, France.

Fusulinella sp. Toriyama, Jour. Geol. Soc. Japan, vol. 48, No. 579, p. 566, text figs. 8, 9. Carboniferous, Japan.

Gaudryina (*Pseudogaudryina*) *sp.* Montagne,

Thesis Univ. Utrecht, p. 50, pl. 6, figs. 11, 12. Eocene, Dalmatia.

Globigerinella sp. I van Bellen, Proc. Nederl. Akad. Wetensch., vol. 44, p. 1000, pl. fig. 23. Eocene, Dalmatia.

Gyroidina sp. nov. van Bellen, *ibid.*, vol. 44, p. 999, pl. fig. 16. Eocene, Dalmatia.

Haplophragmoides sp. Marie, Mém. Mus. Nation. Hist. Nat. Paris, n.s., vol. 12, fasc. 1, p. 21, pl. 1, fig. 8. Senonian, France.

Lagena nov. sp. ? ten Dam and Reinhold, Mededeel. Geol. Stichting Haarlem, (C), vol. 5, No. 1, p. 49, pl. 2, fig. 13. Middle Pliocene Holland.

Marginopora (?) sp. No. 87 Marie, Mém. Soc. Linn. Normandie, n.s., vol. 1, fasc. 1, p. 64, text fig. 9. Recent, Red Sea.

Marginulina sp. van Bellen, Proc. Nederl. Akad. Wetensch., vol. 44, p. 998, pl. fig. 6. Eocene, Dalmatia.

——— *sp.* Marie, Mém. Mus. Nation. Hist. Nat. Paris, n.s., vol. 12, fasc. 1, p. 109, pl. 13, fig. 162. Senonian, France.

Nodosaria n. sp. Montagne, Thesis Univ. Utrecht, p. 52, pl. 6, fig. 27. Eocene, Dalmatia.

——— *sp. I* Montagne, *ibid.*, p. 53, pl. 6, fig. 28. Eocene, Dalmatia.

——— *sp. II* Montagne, *ibid.*, p. 53, pl. 6, fig. 29. Eocene, Dalmatia.

——— *sp. III* van Bellen, Proc. Nederl. Akad. Wetensch., vol. 44, p. 999, pl. fig. 12. Eocene, Dalmatia.

——— *spec. nov. 1* Marschall, Palaeont. Zeitschr., vol. 22, p. 201, text figs. 5, 6. Triassic, Austria.

——— *spec. nov. 2* Marschall, *ibid.*, vol. 22, p. 202, text fig. 1. Triassic, Austria.

? Pellatispirella sp. Montagne, Thesis Univ. Utrecht, p. 58, pl. 7, fig. 11. Eocene, Dalmatia.

Planularia sp. Montagne, *ibid.*, p. 51, pl. 6, fig. 20. Eocene, Dalmatia.

Pleurostomella sp. Montagne, *ibid.*, p. 54, pl. 6, figs. 31, 32. Eocene, Dalmatia.

Polymorphina (?) sp. Marie, Mém. Mus. Nation. Hist. Nat. Paris, n.s., vol. 12, fasc. 1, p. 174, pl. 26, fig. 256. Senonian, France.

Reophax sp. Montagne, Thesis Univ. Utrecht, p. 44, pl. 6, fig. 1. Eocene, Dalmatia.

Sorites sp. No. 83 Marie, Mém. Soc. Linn. Normandie, n.s., vol. 1, fasc. 1, p. 63, text fig. 10. Recent, Red Sea.

? Tritaxia sp. Montagne, Thesis Univ. Utrecht, p. 45, pl. 6, figs. 7, 8. Eocene, Dalmatia.

Tritaxilina nov. sp. van Bellen, Proc. Nederl. Akad. Wetensch., vol. 44, p. 998, pl. fig. 4. Eocene, Dalmatia, Yugoslavia. (Note: This form has been named *Tritaxilina pentagonalis* Montagne, 1941, *ut supra*.)

Uvigerina nov. sp. van Bellen, *ibid.*, vol. 44, p. 999, pl. fig. 15. Eocene, Dalmatia.

Vulvulina sp. I van Bellen, *ibid.*, vol. 44, p. 997, pl. fig. 1, Eocene, Dalmatia.

NOMINA NUDA

Alexseychik, Trans. Geol. Oil. Inst. Leningrad, Moscow, n.s., fasc. 16, 1941, mentions, on p. 50 the following forms which until complete references are available are regarded herewith as *nomina nuda:*

Baggina valvulineriaformis Bykova

Cristellaria klahni Mjatliuk nom. manuscr.

Cristellaria primaformis Mjatliuk var. *mangyschlakensis* nov. var.

Lacroix' two varieties, *Sorites variabilis* Lacroix, 1940 var. *variabilis*, and *S. variabilis* Lacroix var. *affixa*, listed above, should, most probably, also be regarded as *nomina nuda* because no designations regarding holotype or figures are given by the author.

SUPPLEMENT TO INDEX FOR THE YEAR 1942

Adelosina procera A. Silvestri, Boll. Soc. Geol. Italiana, vol. 61, No. 1–2, p. 64 ff. (publication not seen). Described and figured from Pliocene (Calabrian), Italy.

——— *zangherii* A. Silvestri, *ibid.*, vol. 61, Nos. 1–2, p. 64 ff. (publication not seen). Described and figured from Pliocene (Calabrian), Italy.

Amphimorphina dentalinoides Liebus, Palaeont. Zeitschr., vol. 23, p. 71, pl. 3, fig. 13. Triassic, Austria.

Anomalina breggiensis Gandolfi, Riv. Ital. Paleont., vol. 48, Mem. 4, p. 102, pl. 3, fig. 6 (holotype); pl. 5, fig. 3; pl. 9, fig. 1; pl. 13, figs. 7, 8; text fig. 34. Upper Cretaceous, Southern Switzerland.

——— *lorneiana* (d'Orbigny, 1840), var. *trocoidea* Gandolfi, *ibid.*, vol. 48, Mem. 4, p. 99, pl. 2, fig. 1; pl. 4, figs. 2, 3; pl. 13, figs. 2-a, 5-a. Upper Cretaceous, Southern Switzerland.

——— ——— (———) var. *typica* Gandolfi, *ibid.*, vol. 48, Mem. 4, p. 99, pl. 4, fig. 1; pl. 13, figs. 1-a, 4-a. Upper Cretaceous, Switzerland.

——— *roberti* Gandolfi, *ibid.*, vol. 48, Mem. 4, p. 100, pl. 2, fig. 2 (holotype); pl. 4, figs. 4–7, 20; pl. 5, fig. 1; pl. 13, figs. 3–6. Upper Cretaceous, Southern Switzerland.

ASTEROPHRAGMINA subgen. nov. Rao, Rec. Geol. Surv. India, vol. 77, Prof. Pap. No. 12, p. 8. New subgenus of *Pseudophragmina* Douvillé, 1923. Family Discocyclinidae. Genotype: *Pseudophragmina* (*Asterophragmina*) *pagoda* Rao, 1942, *ut infra*. Priabonian.

——— see *Pseudophragmina*.

Bolivina tainanensis Nakamura, Coll. Essays on Geol. and Paleont., p. 90, pl. 5, fig. 7. Neogene, Formosa, Japan.

CHUSANELLA gen. nov. Lee, Bull. Geol. Soc. China, vol. 22, p. 171. Family Fusulinidae. Genotype: *Chusanella ishanensis* Hsu, 1942, *ut infra*. Upper Permian.

——— *ishanensis* Hsu, *ibid.*, vol. 22, p. 175, text figs. 1, 2. Uppermost Permian, Kwangsi, China.

Cibicides peelensis ten Dam and Reinhold, Mededeel. Geol. Stichting, Haarlem, (C), vol. 5, No. 2, p. 100, pl. 8, fig. 8; pl. 10, fig. 1. Middle Miocene, Holland.

——— *reicheli* Gandolfi, Riv. Ital. Paleont., vol. 48, Mem. 4, p. 106, text fig. 38. Upper Cretaceous, Southern Switzerland.

——— *reussi* ten Dam and Reinhold, Mededeel. Geol. Stichting, Haarlem, (C), vol. 5, No. 2,

p. 100, pl. 8, fig. 4; pl. 10, fig. 3. Middle Oligocene, Holland.

Climacammina minima Liebus, Paleont. Zeitschr., vol. 23, p. 55, pl. 3, fig. 3. Triassic, Austria.

Conorbina brotzeni Gandolfi, Riv. Ital. Paleont., vol. 48, Mem. 4, p. 91, text figs. 27, 28. Upper Cretaceous, Southern Switzerland.

COSKINOLINOIDES gen. nov. F. G. Keijzer, Proc. Nederl. Akad. Wetensch., vol. 45, p. 1016. Family not given (Valvulinidae). Genotype: *Coskinolinoides texanus* F. G. Keijzer, 1942, *ut infra*. Lower Cretaceous.

——— *texanus* F. G. Keijzer, *ibid.*, vol. 45, p. 1017, text figs. b–h. Lower Middle Albian, Texas.

CRATERELLA gen. nov. Dons, Kong. Norske Visensk. Selskab Forhandl., vol. 14, No. 36, p. 136. Family Rhabdamminidae; subfamily Saccammininae. Genotype: *Craterella albescens* Dons, 1942, *ut infra*. Recent, Norway.

——— *albescens* Dons, *ibid.*, vol. 14, No. 36, p. 135, text figs. 1–5. Recent, Trondheimsfjord, Norway.

? *Cribrogoësella petkovici* van Soest, Thesis Univ. Utrecht, p. 25, pl. 1, figs. 3, 4. Eocene, Dalmatia Yugoslavia.

Cristellaria (*Lenticulina*) *vonderschmitti* Gandolfi, Riv. Ital. Paleont., vol. 48, Mem. 4, p. 55, text fig. 12. Upper Cretaceous, Southern Switzerland.

——— (*Robulus*) *grandis* ten Dam and Reinhold, Mededeel. Geol. Stichting Haarlem, (C), vol. 5, No. 2, p. 54, pl. 3, fig. 3; pl. 9, fig. 9. Middle Miocene, Holland. [Note: The species name is preoccupied by *Cristellaria americana* Cushman, 1918, var. *grandis* Cushman, 1920, U. S. Geol. Surv., Prof. Pap. 128-B, p. 68, pl. 11, fig. 2.) According to a letter, dated November 6, 1946, from Reinhold, this homonym will be renamed *Cristellaria* (*Robulus*) *teschi* ten Dam and Reinhold.]

Dentalina curva Liebus, Palaeont. Zeitschr., vol. 23, p. 63, pl. 3, fig. 7. Triassic, Austria.

——— *grossicostata* ten Dam and Reinhold, Mededeel. Geol. Stichting Haarlem, (C), vol. 5, No. 2, p. 58, pl. 4, fig. 1. Middle Miocene, Holland.

Dimorphina triassica Liebus, Palaeont. Zeitschr., vol. 23, p. 70, text figs. 8, 9. Triassic, Austria.

Discocyclina olianae Almela and Rios, Not. y Com. Inst. Geol. Min. España, No. 10, p. 57, pls. 1, 2. Eocene, Catalania, Spain.

Discorbis elegantissima Rutgers, Thesis Univ. Utrecht, p. 30, pl. 1, figs. 23, 24. Eocene, Dalmatia, Yugoslavia.

——— *posidonicola* Colom, Inst. Españ. Oceanogr., Notas y Resum., (2), No. 108, p. 37, pl. 7, figs. 149, 150, 152, 153, 156, 157, 161. Recent, Bay of Mallorca, Spain.

Dorothia dalmatina van Soest, Thesis Univ. Utrecht, p. 24, pl. 1, fig. 2. Eocene, Dalmatia, Yugoslavia.

——— *zupensis* Rutgers, *ibid.*, p. 27, pl. 1, figs. 4, 6. Eocene, Dalmatia, Yugoslavia.

Ellipsoglandulina concinna Olbertz, Palaeont. Zeitschr., vol. 23, p. 90, pl. 4, fig. 2. Emscherian, Westphalia, Germany.

Elphidium maioricensis Colom. Inst. Españ. Oceanogr., Notas y Resum., (2), No. 108, p. 34, pl. 10, figs. 189–193. Recent, Bay of Mallorca, Spain.

Eponides bermudezi nom. nov. F. G. Keijzer, Proc. Nederl. Akad. Wetenschr., vol. 45, p. 608. Lower Oligocene, Cuba. New name for: *Eponides byramensis* (Cushman, 1922) var. *cubensis* Palmer and Bermudez, 1936 (non *Eponides cubensis* Palmer and Bermudez, 1935), Mem. Soc. Cubana Hist. Nat., vol. 10, p. 302, pl. 20, figs. 4–6.

——— *gemmata* van Soest, Thesis Univ. Utrecht, p. 21, pl. 1, figs. 11–13. Eocene, Dalmatia, Yugoslavia.

Fissurina see *Lagena*.

Fusulina sinkaiensis Toriyama, Japan. Jour. Geol. and Geogr., vol. 18, p. 241, pl. 24, fig. 6. Upper Permian, Japan.

Gaudryinella mendrisiensis Gandolfi, Riv. Ital. Paleont., vol. 48, Mem. 4, p. 42, pl. 12, figs. 3, 4; text figs. 4–6. Upper Cretaceous, Southern Switzerland.

Globigerina (*Globotruncana*) *marginata* (Reuss, 1845) subsp. *linnaeana* Olbertz, Palaeont. Zeitschr., vol. 23, p. 135, pl. 5, fig. 4. Emscherian, Westphalia, Germany. [Note: Preoccupied by: *Globigerina* (*Rosalina*, *Globotruncana*) *linnaeana* (d'Orbigny, 1839) in Brady, 1884, Rept. Challenger, Zool. vol. 9, p. 598, pl. 94, fig. 21, pl. 82, fig. 12.]

——— (———) ——— ——— subsp. *turona*, Olbertz, *ibid.*, vol. 23, p. 135, pl. 5, fig. 3. Turonian, Westphalia, Germany.

Globotruncana apenninica Renz, 1936 var. *alpha* Gandolfi, Riv. Ital. Paleont., vol. 48, Mem. 4, p. 119, text fig. 40. Upper Cretaceous, Southern Switzerland.

——— ——— ——— var. *beta* Gandolfi, *ibid.*, vol. 48, Mem. 4, p. 119, text figs. 41 Nos. 2 a, b. Upper Cretaceous, Southern Switzerland.

——— ——— ——— var. *gamma* Gandolfi, *ibid.*, vol. 48, Mem. 4, p. 119, text figs. 41 Nrs. 1a, b; 42, No. 1. Upper Cretaceous, Southern Switzerland.

——— *linnei* (d'Orbigny, 1839) var. *angusticarinata* Gandolfi, *ibid.*, vol. 48, Mem. 4, p. 127, pl. 4, figs. 17, 30; text fig. 46 No. 3. Upper Cretaceous, Southern Switzerland.

——— ——— (———) var. *tipica* Gandolfi, *ibid.*, vol. 48, Mem. 4, p. 127, pl. 3, fig. 3; pl. 4, figs. 18, 31, text figs. 46 Nos. 1, 2. Upper Cretaceous, Southern Switzerland.

——— *renzi* Gandolfi, *ibid.*, vol. 48, Mem. 4, p. 124, pl. 3, fig. 1; pl. 4, figs. 28, 29; pl. 11, fig. 2. Upper Cretaceous, Southern Switzerland, For: "Zwischenform Renz, 1936, Eclog. geol. Helv., vol. 29, pl. 4, figs. 16–19, 21, 24–26; pl. 8, figs. 2, 3, 5 only." [Note: Based on the same "Zwischenform Renz, 1936" Thalmann erected in April 1942 (see Jour. Paleontology, 1945, vol. 19, p. 405) a new species with the *same* specific name. Gandolfi's name was published on August 31, 1942. It is, therefore, proposed in

a forthcoming paper by the compiler to use in future for this form the author-combination *Globotruncana renzi* Thalmann-Gandolfi 1942.]

——— *stephani* Gandolfi, *ibid.*, vol. 48, Mem. 4, p. 130, pl. 3, fig. 4 (holotype); pl. 3, fig. 5; pl. 4, figs. 36, 37, 41–45; pl. 6, figs. 4, 6; pl. 6, figs. 4, 6; pl. 9, figs. 5, 8; pl. 13, fig. 5; pl. 14, fig. 2. Upper Cretaceous, Southern Switzerland.

——— *ticinensis* Gandolfi, *ibid.*, vol. 48, Mem. 4, p. 113, pl. 2, fig. 3 (holotype); pl. 4, figs. 8–11, 21–24; pl. 5, figs. 2, 4; pl. 8, figs. 3–7; pl. 11, fig. 5; pl. 12, fig. 1; pl. 13, figs. 9–11, 13; text fig. 39. Upper Cretaceous, Switzerland.

——— ——— ——— var. *alpha* Gandolfi, *ibid.*, vol. 48, Mem. 4, p. 114, pl. 2, fig. 4. Upper Cretaceous, Southern Switzerland.

Globotruncana see also *Globigerina*.

Gyroidina tainanensis Nakamura, Coll. Essays on Geol. and Paleont., p. 91, pl. 6, fig. 3 Neogene, Formosa, Japan.

Lagena globosa (Montagu, 1803) subsp. *siphonifera* Olbertz, Palaeont. Zeitschr., vol. 23, p. 98, pl. 4, fig. 3. Lower Senonian, Westphalia, Germany.

——— (*Fissurina*) *marginata* (Walker and Boys, 1784) subsp. *costata* Olbertz, *ibid.*, vol. 23, p. 103, pl. 4, fig. 4. Lower Senonian, Westphalia, Germany. [Note: The varietal or subspecific name is preoccupied by a) *Lagena costata* (Williamson, *Entosolenia* 1858), Rec. Brit. Foram., p. 9, pl. 1, fig. 18; b) *Lagena auriculata* Brady, 1881, var. *costata* Brady, 1881, Quart. Jour. Microscop. Sci., vol. 21, p. 61.]

Lenticulina see *Cristellaria*.

Lepidocyclina (*Polylepidina*) *birmanica* Rao, Rec. Geol. Surv. India, vol. 77, Prof. Pap. No. 12, p. 6, pl. 1, figs. 1, 4–6; pl. 2, figs. 3, 7. Priabonian, Burma.

Lingulina aenariensis Buchner, Nova Acta Leopold., n.s., vol. 11, No. 75, p. 137, text fig. 16. Subfossil, Island Ischia, Italy.

——— *aselliformis* nom. nov. Buchner, *ibid.*, vol. 11, No. 75, p. 121, text fig. 3. Recent, Island Ischia, Italy. New name for: *Lingulina spathulata* Sidebottom, 1907.

——— *cornigera* nom. nov. Buchner, *ibid.*, vol. 11, No. 75, p. 126, text fig. 7. Subfossil and Recent, Island Ischia, Italy. New name for: *Lingulina pellucida* Heron-Allen and Earland, 1916.

——— *cuculifera* Buchner, *ibid.*, vol. 11, No. 75, p. 131, text fig. 10. Subfossil, Island Ischia, Italy.

——— *inarimensis* Buchner, *ibid.*, vol. 11, No. 75, p. 134, text fig. 13. Subfossil, Island Ischia, Italy.

——— *incisa* Buchner, *ibid.*, vol. 11, No. 75, p. 131, text fig. 11. Subfossil, Island Ischia, Italy.

——— *kansireiensis* Nakamura, Coll. Essays on Geol. and Palaeont., p. 92, pl. 6, fig. 4. Neogene, Formosa, Japan.

——— *lagenoides* nom. nov. Buchner, Nova Acta Leopold., n.s., vol. 11, No. 75, p. 136, text fig. 15. Subfossil, Island Ischia, Italy. New name for: *Lagena furcata* Heron-Allen and Earland, 1916.

——— *neglecta* Buchner, nom. nov. *ibid.*, vol. 11, No. 75, p. 129, text fig. 9. Recent, Island Ischia, Italy. New name for *Lingulina carinata* Sidebottom, 1907.

——— *pellucida* Sidebottom, 1907, var. *denticulata* Buchner, *ibid.*, vol. 11, No. 75, p. 124, text fig. 5. Recent, Island Ischia, Italy.

——— *pseudocarinata* Buchner, *ibid.*, vol. 11, No. 75, p. 119, text fig. 1. Recent, Island Ischia, Italy.

——— *simplex* Buchner, *ibid.*, vol. 11, No. 75, p. 120, text fig. 2. Subfossil, Island Ischia, Italy.

——— *sirakawaensis* Nakamura, Coll. Essays on Geol. and Palaeont., p. 92, pl. 6, fig. 5. Neogene, Formosa, Japan.

Lituonella makarskae van Soest, Thesis Univ. Utrecht, p. 27, pl. 1, figs. 18–20. Eocene, Dalmatia, Yugoslavia.

MAKARSKIANA gen. nov. van Soest, *ibid.*, p. 27. Family Valvulinidae. Genotype: *Makarskiana trochoidea* van Soest, 1942, *ut infra*. Eocene.

——— *trochoidea* van Soest, *ibid.*, p. 27, figs. 22–25. Eocene, Dalmatia, Yugoslavia.

Marginulina dingdeni nom. nov. ten Dam and Reinhold, Mededeel. Geol. Stichting Haarlem, (C), vol. 5, No. 2, p. 56, pl. 3, fig. 7; pl. 9, fig. 3. Middle Miocene, Holland. New name for: *Cristellaria hirsuta* Hosius, 1892 (non d'Orbigny, 1826, *Marginulina*), Verhandl. Nat. Ver. Rheinland u. Westfalen, vol. 49, p. 185, pl. 3, fig. 5.

Nodosaria scalaroides ten Dam and Reinhold, *ibid.*, vol. 5, No. 2, p. 64, pl. 4, fig. 5; pl. 9, fig. 5. Middle Miocene, Holland.

——— *tainanensis* Nakamura, Essays on Geol. and Palaeont., p. 91, pl. 6, fig. 2. Neogene, Formosa, Japan.

Nonion nonionelloides ten Dam and Reinhold, Mededeel. Geol. Stichting Haalrem, (C), vol. 5, No. 2, p. 77, pl. 5, fig. 5; pl. 9, fig. 1. Upper Oligocene, Holland.

Nubecularia massutina Colom, Inst. Inst. Español. Oceanogr., Notas y Resum., (2), No. 108, p. 30, pl. 7, figs. 158–160; pl. 9, figs. 178, 179; pl. 11, figs. 216, 217, 219. Recent, Bay of Mallorca, Spain.

Nummulites cretaceus Pérébaskine, Bull. Soc. géol. France, (5), vol. 12, p. 119, text figs. 1–7. Upper Cretaceous, France. (Note: Preoccupied by *Nummulites cretacea* Fraas, 1867, Württemberg. Naturhist. Jahreshefte, p. 227, pl. 2, fig. 8. According to a letter received from the author, dated October 21, 1946, the homonym will be changed to *Nummulites senonicus* Pérébaskine.)*

Operculina kaiensis Nakamura, Coll. Essays on Geol. and Palaeont., p. 34, pl. figs. 21–24. Miocene, Japan.

* In January 1947, V. Pérébaskine rectified his homonym and substituted for it *Nummulites senonicus nomen mutatum*. (See: Comptes rendus Soc. géol. France, No. 14, Séance du 18 novembre, 1946, p. 297.)

Orbulinaria fallax Rhumbler, 1909, subsp. *pyramidalis* Olbertz, Palaeont. Zeitschr., vol. 23, p. 85, pl. 4, fig. 1. Emscherian, Westphalia, Germany.

Parafusulina yabei Hanzawa, Japan. Jour. Geol. and Geogr., vol. 18, p. 127, pls. 13 and 14. Artinskian, Japan. For: *Fusulina japonica* Yabe, 1899 (non Gümbel, 1874 in Schwager, 1883), Jour. Geol. Soc. Tokyo, vol. 6, No. 68, p. 189, text figs. 1–4 (in Japanese); for same reference in Yabe, 1903, *loc. cit.*, vol. 10, No. 113, p. 62, pls. 2 and 3; and for same reference in Yabe, 1906, Jour. College Sci. Imp. Univ. Tokyo, vol. 21, art. 5, pl. 2, fig. 1.

Planularia luzonica Asano, Jour. Geol. Soc. Japan, vol. 49, No. 586, p. 293, pl. 11, fig. 15. Pliocene, Luzon, Philippine Islands.

——— *mindoroensis* Asano; *ibid.*, vol. 49, No. 586, p. 292, pl. 11, fig. 8. Pliocene, Mindoro, Philippine Islands.

Planulina alticosta ten Dam and Reinhold, Mededeel. Geol. Stichting Haarlem, (C), vol. 5, No. 2, p. 97, pl. 8, figs. 1, 2; pl. 10, fig. 4. Middle and Upper Oligocene, Holland.

——— *buxtorfi* Gandolfi, Riv. Ital. Paleontologia, vol. 48, Mem. 4, p. 103, pl. 3, fig. 7 (holotype); pl. 5, figs. 3–6; pl. 6, figs. 1–3; pl. 8, fig. 8; pl. 9, fig. 2; pl. 12, figs. 2; pl. 13, figs. 12, 13; text fig. 35. Upper Cretaceous, Southern Switzerland.

Polylepidina see *Lepidocyclina*.

Proporocyclina see *Pseudophragmina*.

Pseudocyclammina virguliana Koechlin, Eclog. geol. Helv., vol. 35, p. 195, pl. 6, figs. 1–7. Upper Kimmeridgian-Lower Portlandian, Jura Mountains, Switzerland.

Pseudophragmina (*Asterophragmina*) *pagoda* Rao, Rec. Geol. Surv. India, Prof. Pap. 12, vol. 77, p. 8, pl. 1, fig. 3; pl. 2, figs. 1, 2, 4, 6. Priabonian, Burma. For: *Discocyclina* (*Asterocyclina*) *sp.* Rao, 1940, Current Science, Bangalore, vol. 9, p. 415, text fig. 2.

——— (*Proporocyclina*) *pertenuis* Brönnimann, Schweiz. Palaeont. Abhandl., vol. 63, p. 2, pl. 1, figs. 1–16; pl. 2, figs. 1–5; text figs. 1–7. Eocene, Venezuela. For: *Discocyclina* (*Discocyclina*) *flintensis* Gorter and Van der Vlerk, 1932 (non Cushman, 1917), Leidsche Geol. Mededeel., vol. 4, p. 111, pl. 16, figs. 5, 6; and for: *Discocyclina sp. indet.* Gravell, 1933, Smithson. Miscell. Coll., vol. 89, p. 21, pl. 2, figs. 8, 9.

Pyrgo natukawa Matui and Nakagawa, Jour. Geol. Soc. Japan, vol. 49, No. 588, p. 359, text figs. 2–4. Pliocene, Japan.

Quinqueloculina kansireiensis Nakamura, Coll. Essays on Geol. and Palaeont., p. 91, pl. 6, fig. 1. Neogene, Formosa, Japan.

——— *placenta* A. Silvestri, Boll. Soc. geol. Italiana, vol. 61, Nrs. 1–2, p. 64 ff. (publication not seen); described and figured from Pliocene, Calabrian, Italy.

——— *transversestriata* van Soest, Thesis Univ. Utrecht, p. 25, pl. 1, figs. 5, 6. Eocene, Dalmatia, Yugoslavia.

Robulus pseudoechinatus Asano, Jour. Geol. Soc. Japan, vol. 49, No. 586, p. 291, pl. 11, fig. 2. Oligocene, Luzon, Philippine Islands.

——— *sumaguiensis* Asano, *ibid.*, vol. 49. No. 586, p. 290, pl. 11, fig. 10. Pliocene, Mindoro and Marinduque, Philippine Islands.

Robulus see also *Cristellaria*.

Rotalia exsculpta Reuss, 1860, subsp. *granulata* Olbertz, Palaeont. Zeitschr., vol. 23, p. 132, pl. 5, fig. 2. Emscherian, Westphalia, Germany.

Siphogenerina multicostata Cushman and Jarvis, 1929, var. *denticosta* G. F. Keijzer, Proc. Nederl. Akad. Wetenschr., vol. 45, p. 608, text figs. 1, 2. Lower Oligocene, Cuba.

Spandelina triassica Liebus, Palaeont. Zeitschr., vol. 23, p. 60, pl. 3, fig. 5; text fig. 2. Triassic, Austria.

Spiroloculina striatula ten Dam and Reinhold, Mededeel. Geol. Stichting Haarlem, (C), vol. 5, No. 2, p. 47, pl. 2, figs. 1–4; pl. 9, fig. 6; text fig. 4. Middle Miocene, Holland.

Spiroplecta turona Olbertz, Palaeont. Zeitschr., vol. 23, p. 120, pl. 4, fig. 6. Turonian, Westphalia, Germany.

Spiroplectinata westfalica Olbertz, ibid., vol. 23, p. 122, pl. 4, fig. 7. Emscherian, Westphalia, Germany.

Stacheia triassica Liebus, *ibid.*, vol. 23, p. 56, pl. 3, fig. 4. Triassic, Austria.

Textularia hakusikeiensis Nakamura, Coll. Essays on Geol. and Palaeont., p. 90, pl. 5, fig. 6. Neogene, Formosa, Japan.

——— *kansireiensis* Nakamura, *ibid.*, p. 87, pl. 5, fig. 1. Neogene, Formosa, Japan.

——— *latistoma* Rutgers, Thesis Univ. Utrecht, p. 24, pl. 1, figs. 7, 8; pl. 4, fig. 5. Eocene, Dalmatia, Yugoslavia.

——— *rokuzyukeiensis* Nakamura, Coll. Essays on Geol. and Palaeont., p. 89, pl. 5, fig. 5. Neogene, Formosa, Japan.

——— *sin'eiensis* Nakamura, *ibid.*, p. 89, pl. 5, fig. 4. Neogene, Formosa, Japan.

——— *sirakawaensis* Nakamura, *ibid.*, p. 88, pl. 5, fig. 2. Neogene, Formosa, Japan.

——— *tainanensis* Nakamura, *ibid.*, p. 88, pl. 5, fig. 3. Neogene, Formosa, Japan.

Turritellella procera Liebus, Palaeont. Zeitschr., vol. 23, p. 54, pl. 3, fig. 2; text fig. 1. Triassic, Austria.

Vaginulina striatula ten Dam and Reinhold, Mededeel. Geol. Stichting Haarlem, (C), vol. 5, No. 2, p. 65, pl. 4, fig. 10; pl. 9, fig. 12. Middle Miocene, Holland. (Note: Preoccupied by *Vaginulina striatula* Roemer, 1842, N. Jahrb. Min. etc., p. 273, pl. 7-B, figs. 2 a–c. According to a letter received from Reinhold, dated November 6, 1946, this homonym will be renamed *Vaginulina obtusicosta* ten Dam and Reinhold.)

Vaginulinopsis asanoi Ishizaki, Trans. Nat. Hist. Soc. Formosa, vol. 32, No. 221, p. 106, text figs. 1–3. Pliocene, Japan.

Valvulina trochoides (Reuss, 1845) subsp. *elongata*

Olbertz, Palaeont. Zeitschr., vol. 23, p. 126, pl. 4, fig. 8. Emscherian, Westphalia, Germany.

Verneuilina elegans Rutgers, Thesis Univ. Utrecht, p. 24, pl. 1, figs. 3, 4. Eocene, Dalmatia, Yugoslavia.

——— *wicheri* Olbertz, Palaeont. Zeitschr., vol. 23, p. 114, pl. 4, fig. 5. Turonian, Westphalia, Germany.

Yabeina yasubaensis Toriyama, Japan. Jour. Geol. and Geogr., vol. 18, p. 246, pl. 25, figs. 8–13. Upper Permian, Japan.

FORMS WITH NOMENCLATURA APERTA

Ammosphaeroidina sp. Gandolfi, Riv. Ital. Paleont., vol. 48, Mem. 4, p. 49, text fig. 10. Upper Cretaceous, Switzerland.

Ammospirata sp. nov. Rutgers, Thesis Univ. Utrecht, p. 24, pl. 1, figs. 1, 2. Eocene, Dalmatia.

Asterigerina sp. nov. Rutgers, *ibid.*, p. 30, pl. 1, figs. 33–35. Eocene, Dalmatia.

Chilostomelloides n. sp. Rutgers, *ibid.*, p. 31, pl. 1, figs. 28, 29. Eocene, Dalmatia.

Cibicides sp. Nakamura, Essays on Geol. and Paleont., pl. 17, fig. 3. Neogene, Japan.

Cornuspira sp. Huzimoto, Takushoku Daigaku Kenkyujo, No. 1, p. 34, pl. 2, figs. 24–27. Paleozoic, Manchuria.

Dictyoconus sp. Rutgers, Thesis Univ. Utrecht, p. 8, pl. 2, figs. 14, 16, 17. Upper Cretaceous or Paleocene, Dalmatia.

Discorbis sp. Gandolfi, Riv. Ital. Paleont., vol. 48, Mem. 4, p. 92, text fig. 29. Upper Cretaceous, Switzerland.

Endothyra sp. Huzimoto, Takushoku Daigaku Kenkyujo, No. 1, p. 34, pl. 2, fig. 31. Paleozoic, Manchuria.

Frondicularia sp. ten Dam and Reinhold, Mededeel. Geol. Stichting Haarlem, (C), vol. 5, No. 2, p. 66, pl. 9, fig. 10. Middle Miocene, Holland. (Note: This form has been named *Polymorphina costulata* ten Dam, 1944, *ut infra.*)

Gaudryina sp. Nakamura, Coll. Essays on Geol. and Palaeont., p. 122, pl. 7, fig. 7. Neogene, Japan.

Glomospira sp. Huzimoto, Takushoku Daigaki Kenkyujo, Nr. 1, p. 34, pl. 2, fig. 36. Paleozoic, Manchuria.

Guttulina sp. Nakamura, Coll. Essays on Geol. and Paleont., pl. 11, fig. 8. Neogene, Japan.

Lagena sp. Nakamura, *ibid.*, pl. 11, fig. 6. Neogene, Japan.

Loxostoma sp. van Soest, Thesis Univ. Utrecht, p. 25, pl. 1, fig. 8. Eocene, Dalmatia.

Marginulina sp. Gandolfi, Riv. Ital Paleont., vol. 48, Mem. 4, p. 62, text fig. 18. Upper Cretaceous, Switzerland.

Massilina sp. Nakamura, Coll. Essays on Geol. and Paleont., pl. 10, fig. 3. Neogene, Japan.

Nodosaria sp. Nakamura, *ibid.*, pl. 11, fig. 4. Neogene, Japan.

Nodosarella sp. Gandolfi, Riv. Ital Paleont., vol. 48, Mem. 4, p. 89, text fig. 25. Upper Cretaceous, Switzerland.

Operculinoides sp. Rao, Rec. Geol. Surv. India, vol. 77, Prof. Pap. No. 12, p. 14, pl. 1, fig. 2; pl. 2, fig. 5. Priabonian, Burma.

Parafusulina sp. Toriyama, Jour. Geol. Soc. Japan, vol. 49, No. 581, p. 35, text fig. 2. Permo-Carboniferous, Japan.

Pseudodoliolina sp. Toriyama, *ibid.*, vol. 49, No. 581, p. 34, text figs. 1, 3, 4.

Pseudoglandulina sp. Gandolfi, Riv. Ital Paleont., vol. 48, Mem. 4, p. 75, text fig. 19. Upper Cretaceous, Switzerland.

Pseudononion sp. Nakamura, Coll. Essays on Geol. and Palaeont., pl. 11, fig. 14. Neogene, Japan.

Quinqueloculina sp. Nakamura, *ibid.*, p. 122, pl. 7, fig. 10. Neogene, Japan.

——— *sp.* Nakamura, *ibid.*, pl. 8, fig. 2. Neogene, Japan.

——— *sp.* Nakamura, *ibid.*, pl. 9, fig. 2, Neogene, Japan.

——— *sp.* Nakamura, *ibid.*, pl. 9, fig. 3, Neogene, Japan.

——— *sp.* Nakamura, *ibid.*, pl. 9, fig. 4, Neogene, Japan.

——— *sp.* Nakamura, *ibid.*, pl. 9, fig. 5. Neogene, Japan.

Rhapydionina sp. Rutgers, Thesis Univ. Utrecht, p. 8, pl. 2, fig. 15. Upper Cretaceous or Paleocene, Dalmatia.

Rotalia sp. Nakamura, Coll. Essays on Geol. and Palaeont., pl. 15, fig. 3. Neogene, Japan.

——— *sp.* Nakamura, *ibid.*, pl. 16, fig. 2. Neogene, Japan.

Saracenaria sp. Rutgers, Thesis Univ. Utrecht, p. 29, pl. 1, fig. 18. Eocene, Dalmatia.

Schwagerina sp. alpha Toriyama, Japan. Jour. Geol. and Geogr., vol. 18, p. 242, pl. 24, fig. 7. Upper Permian, Japan.

——— *sp. beta* Toriyama, *ibid.*, vol. 18, p. 243, pl. 24, fig. 8. Upper Permian, Japan.

Siphonina sp. van Soest, Thesis Univ. Utrecht, p. 26, pl. 1, fig. 14. Eocene, Dalmatia.

Textularia sp. Huzimoto, Takushoku Daigaku Kenkyujo, No. 1, p. 34, pl. 2, fig. 38. Paleozoic, Manchuria.

——— *sp.* Nakamura, Coll. Essays on Geo. land Palaeont., p. 122, pl. 7, fig. 4. Neogene, Japan.

——— *sp.* Nakamura, *ibid.*, p. 122, pl. 7, fig. 5. Neogene, Japan.

Triloculina sp. van Soest, Thesis Univ. Utrecht, p. 34, pl. 1, fig. 7. Eocene, Dalmatia.

Triticites sp. alpha Toriyama, Japan. Jour. Geol. and Geogr., vol. 18, p. 241, pl. 24, fig. 4. Upper Permian, Japan.

——— *sp. beta* Toriyama, *ibid.*, vol. 18, p. 241, pl. 24, fig. 5. Upper Permian, Japan.

Vaginulina sp. ten Dam and Reinhold, Mededeel. Geol. Stichting Haarlem, (C), vol. 5, No. 2, p. 66, pl. 4, fig. 9. Middle Miocene, Holland.

SUPPLEMENT TO INDEX FOR THE YEAR 1943

Anomalina avilensis van Wessem, Thesis Univ. Utrecht, p. 48, pl. 2, figs. 5–7. Upper Cretaceous, Cuba.

Astacolus see *Lenticulina.*

Bullopora chapmani (Plummer, 1927) var. *hispida*

Kline, Mississippi State Geol. Surv. Bull. 53, p. 43, pl. 4, fig. 12. Paleocene, Mississippi.

——— *laevis* (Sollas, 1877) var. *hispida* Kline, *ibid.*, Bull. 53, p. 43, pl. 4, fig. 16. Paleocene, Mississippi. [Note: This variety is preoccupied by *Bullopora chapmani* (Plummer) var. *hispida* Kline, 1943, *ut supra.*]

Cassidulina carandelli Colom, Bol. R. Soc. Españ. Hist. Nat., vol. 41, p. 324, pl. 23, figs. 65–67. Miocene (Burdigalian), Mallorca, Spain.

——— *crispula* Cushman and Bermudez, 1936, subsp. *simplex* Colom, *ibid.*, vol. 41, p. 325, pl. 23, figs. 68–70. Miocene (Burdigalian), Mallorca, Spain.

Chilostomella subtriangularis Kline, Mississippi State Geol. Surv., Bull. 53, p. 56, pl. 6, fig. 3. Paleocene, Mississippi.

Cibicides arteagai van Wessem, Thesis Univ. Utrecht, p. 49, pl. 2, figs. 14–16. Upper Cretaceous, Cuba.

——— *browni* Kline, Mississippi State Geol. Surv., Bull. 53, p. 62, pl. 7, figs. 18–20. Paleocene, Mississippi.

——— *camagueyensis* van Wessem, Thesis Univ. Utrecht, p. 50, pl. 2, figs. 17–19. Upper Cretaceous, Cuba.

——— *cicatricosa* (Schwager, 1866) subsp. *maioricensis* Colom, Bol. R. Soc. Españ. Hist. Nat., vol. 41, p. 327, pl. 22, figs. 24–32. Miocene (Burdigalian) Mallorca, Spain.

——— *floridana* (Cushman, 1918) subsp. *burdigalensis* Colom, *ibid.*, vol. 41, p. 326, pl. 22, figs. 18–23. Miocene (Burdigalian), Mallorca, Spain.

Ehrenbergina cubensis Cushman and Bermudez, 1936, subsp. *pollentiana* Colom, *ibid.*, vol. 41, p. 325, pl. 23, figs. 54–64. Miocene (Burdigalian), Mallorca, Spain.

Elphidiella see *Elphidium.*

Elphidium crispum (Linné, 1758) subsp. *biniacoensis* Colom, Bol. R. Soc. Españ. Hist. Nat., vol. 41, p. 328, pl. 24, figs. 79–84. Miocene (Helvetian), Mallorca, Spain.

——— *tongaense* (Cushman, 1931) var. *ozawaia* Earland and Jepps, Jour. R. Micr. Soc., vol. 58, pp. 45–47. Recent, Tonga Islands. For: *Ozawaia tongaensis* Cushman, 1931, Contr. Cushman Lab. Foram. Res., vol. 7, pl. 10, figs. 7–10.; and for: *Polystomella crispa* Millet, 1904, (non Linné, 1758), Jour. R. Micr. Soc., p. 603, pl. 11, fig. 2. (Note: The genus *Ozawaia* Cushman becomes a *genus deletum* and a synonym of *Elphidium* Montfort, 1808.)

——— (*Elphidiella*) *asklundi* Brotzen, Bull. Geol. Inst. Uppsala, vol. 31, p. 267, text fig. 109 No. 1. Late Pleistocene, Sweden.

——— (———) *hallandense* Brotzen, *ibid.*, vol. 31, p. 268, text fig. 109 No. 2. Postglacial, Sweden.

Entosolenia morsei Kline, Mississippi State Geol. Surv., Bull. 53, p. 48, pl. 4, fig. 17. Paleocene, Mississippi.

Eouvigerina lobatula van Wessem, Thesis Univ. Utrecht, p. 46, pl. 1, fig. 45. Upper Cretaceous, Cuba.

Eponides byramensis (Cushman, 1922) subsp. *hispanicus* Colom, Bol. R. Soc. Españ. Hist. Nat., vol. 41, p. 322, pl. 24, figs. 71–73, 77,78. Miocene, (Burdigalian), Mallorca, Spain.

Fusulina cylindrica Fischer, 1837, var. *hispanica* Gubler, Mém. Acad. Sci. Inst. France, vol. 66, (2), p. 105. Onomatype. Moscovian, Spain.

Fusulinella bocki v. Möller, 1878, var. *delepinei* Gubler, *ibid.*, vol. 66, (2), p. 102, pl. 2, figs. 1–7; text fig. 15, Moscovian, Spain.

Gümbelina morsei Kline, Mississippi State Geol. Surv., Bull. 53, p. 44, pl. 7, fig. 12. Paleocene, Mississippi.

LACOSTEINA gen. nov. Marie, Bull. Soc. géol. France, (5), vol. 13, p. 295. (Published June, 1945.) Family Buliminidae. Genotype: *Lacosteina gouskovi* Marie, 1943 (1945), *ut infra.* Upper Cretaceous.

——— *gouskovi* Marie, *ibid.*, (5), vol. 13, p. 296, text figs. 1–6. Upper Cretaceous, Morocco. (Published June 1945.)

Lagena ornaticollis Colom, Bol. R. Soc. Españ. Hist. Nat., vol. 41, p. 321, pl. 22, figs. 39–42. Miocene (Burdigalian), Mallorca, Spain.

——— *vikensis* Hesslund, Bull. Geol. Inst. Uppsala, vol. 31, p. 266, pl. 2, fig. 31. Subfossil, Sweden.

Lenticulina (*Astacolus*) *sublitua* (Nuttall, 1932), subsp. *jordai* Colom, Bol. R. Soc. Españ. Hist. Nat., vol. 41, p. 318, pl. 21, figs. 1–5, 14, 15; pl. 24, figs. 74–76. Miocene (Burdigalian), Mallorca, Spain.

Lepidorbitoides estrellae van Wessem, Thesis Univ. Utrecht, p. 53, pl. 2, fig. 32; pl. 3, figs. 12, 13. Upper Cretaceous, Cuba.

——— *tschoppi* van Wessem, *ibid.*, p. 53, pl. 2, fig. 33; pl. 3, figs. 18, 19. Upper Cretaceous, Cuba.

Lingulina arteagai van Wessem, *ibid.*, p. 42, pl. 1, figs. 18, 19. Upper Cretaceous, Cuba.

Nodosarella morrowi van Wessem, *ibid.*, p. 47, pl. 1, fig. 48. Upper Cretaceous, Cuba. For: *Nodosarella nov. spec.* Morrow, 1934, Jour. Paleontology, vol. 8, p. 197, pl. 29, figs. 2, 3.

Nonion cubense van Wessem, *ibid.*, p. 51, pl. 2, figs. 26, 27. Oligo-Miocene, Cuba.

Plectofrondicularia deayensis Colom, Bol. R. Soc. Españ. Hist. Nat., vol. 41, p. 321, pl. 22, figs. 33–38. Miocene (Burdigalian), Mallorca, Spain.

PRAERHAPYDIONINA gen. nov. van Wessem, Thesis Univ. Utrecht, p. 43. Family Peneroplidae. Genotype: *Praerhapydionina cubana* van Wessem, 1943, *ut infra.* Upper Cretaceous.

——— *cubana* van Wessem, *ibid.*, p. 43, pl. 3, figs. 2–7. Upper Cretaceous, Cuba.

Pseudoclavulina camagueyensis van Wessem, *ibid.*, p. 30, pl. 1, figs. 3, 4. Upper Cretaceous, Cuba.

Pseudoschwagerina fragilis Ciry, Ann. Paléont. Paris, vol. 30, no. 20, pl. 4 (8), figs. 3–5. Probably Uralian, Turkey.

——— *galeata* Ciry, *ibid.*, p. 15, pl. 2 (6), figs. 1–4. Sakmarian-Artinskian, Turkey.
——— *nucleolata* Ciry, *ibid.*, vol. 30, p. 22, megalospheric forms: text fig. 10 and pl. 3(7), figs. 2, 4–6; megalospheric forms with giant proloculus: text fig. 15, pl. 3(7), fig. 3, and pl. 4(8). Artinskian, Turkey.
——— *regularis* Ciry, *ibid.*, vol. 30, p. 25, pl. 4(8), fig. 2. Artinskian, Turkey.
——— *subrotundata* Ciry, *ibid.*, vol. 30, p. 17, pl. 2(6), figs. 5–8; pl. 3(7), fig. 1; text fig. 14. Sakmarian-Artinskian, Turkey.
Pulvinulinella camagueyensis van Wessem, Thesis Univ. Utrecht, p. 50, pl. 2, figs. 21–23. Upper Eocene, Cuba.

Robulus costatus (Fichtel and Moll, 1803) subsp. *gymnesicus* Colom, Bol. R. Soc. Espan. Hist. Nat., vol. 41, p. 333, pl. 26, figs. 105–116. Miocene (Helvetian), Mallorca, Spain.
——— *pseudo-costatus* (Plummer, 1927), var. *inornatus* Kline, Mississippi State Geol. Surv., Bull. 53, p. 18, pl. 1, fig. 6. Paleocene, Mississippi. [Note: The varietal name is preoccupied by *Robulina* (*Robulus*) *inornata* d'Orbigny, 1846, Foram. Foss. Vienne, p. 102, pl. 4, figs. 25, 26.]
——— *thalmanni* Hesslund, Bull. Geol. Inst. Uppsala, vol. 31, p. 265, pl. 2, fig. 16. Late Pleistocene, Sweden. For: *Cristellaria rotulata* Brady, 1884 (non Lamarck, 1804), Rept. Challenger, Zool. vol. 9, p. 547, pl. 69, fig. 18. [Note: *cave Cristellaria* (*Planularia*) *thalmanni* Pijpers, 1933.]

Siderolites claztiensis Ruiz de Gaona, Bol. R. Soc. Espan. Hist. Nat., vol. 41, p. 96, pl. 1, figs. 19–26. Maestrichtian, Spain.
Saracenaria midwayensis Kline, Mississippi State Geol. Surv., Bull. 53, p. 30, pl. 3, fig. 3. Paleocene, Mississippi.
——— *proximocostata* van Wessem, Thesis Univ. Utrecht, p. 42, pl. 1, figs. 24, 25. Upper Cretaceous, Holland.
Siphonina bradyana (Cushman, 1927) subsp. *burdigalensis* Colom, Bol. R. Soc. Espan. Hist. Nat., vol. 41, p. 323, pl. 23, figs. 45–53. Miocene (Burdigalian), Mallorca, Spain.

Vaginulina pseudoclavata Colom, *ibid.*, vol. 41, p. 319, pl. 21, figs. 6–13, 16, 17. Miocene (Burdigalian), Mallorca, Spain.

FORMS WITH NOMENCLATURA APERTA

Dentalina (*?*) *sp.* Kline, Mississippi State Geol. Surv., Bull. 53, p. 26, pl. 7, fig. 22. Paleocene, Mississippi.
Discocyclina sp. A van Wessem, Thesis Univ. Utrecht, p. 56, pl. 3, fig. 26. Upper Eocene, Cuba.
——— *sp. B* van Wessem, *ibid.*, p. 56, pl. 3, fig. 27. Upper Eocene, Cuba.
Dorothia nov. sp. van Wessem, *ibid.*, p. 30, pl. 1, figs. 6, 7. Upper Cretaceous, Cuba.
——— *sp.* Kline, Mississippi State Geol. Surv. Bull. 53, p. 17, pl. 7, figs. 6, 7. Paleocene, Mississippi.
——— *sp.* van Wessem, Thesis Univ. Utrecht, p. 31, pl. 1, figs. 8, 9. Upper Cretaceous, Cuba.
Ellipsonodosaria sp. van Wessem, *ibid.*, p. 50, pl. 2, fig. 20. Upper Eocene, Cuba.
Elphidium sp. I van Wessem, *ibid.*, p. 51, pl. 2, figs. 28, 29. Oligo-Miocene, Cuba.
——— *sp. II* van Wessem, *ibid.*, p. 52, pl. 2, figs. 30, 31. Oligo-Miocene, Cuba.
Gaudryina sp. Kline, Mississippi State Geol. Surv., Bull. 53, pl. 15, pl. 7, fig. 14. Paleocene, Mississippi.
Globorotalia nov. sp. van Wessem, Thesis Univ. Utrecht, p. 48, pl. 2, figs. 3, 4. Upper Cretaceous, Cuba.
Globotruncana nov. sp. van Wessem, *ibid.*, p. 48, pl. 1, fig. 57; pl. 2, figs. 1, 2. Upper Cretaceous, Cuba.
——— *sp.* Kline, Mississippi State Geol. Surv., Bull. 53, p. 59, pl. 6, fig. 4. Paleocene, Mississippi.
Heterostomella sp. Kline, *ibid.*, Bull. 53, p. 16, pl. 7, fig. 3. Paleocene, Mississippi.
Lepidorbitoides sp. Ruiz de Gaona, Bol. R. Soc. Espan. Hist. Nat., vol. 41, p. 101, pl. 1, figs. 9, 10. Maestrichtian, Spain.
——— *sp.* van Wessem, Thesis Univ. Utrecht, p. 55, pl. 3, fig. 20. Upper Cretaceous, Cuba.
Marginulina sp. van Wessem, *ibid.*, p. 41, pl. 1, fig. 23. Upper Cretaceous, Cuba.
Parafusulina sp. Toriyama and Choh, Proc. Imp. Acad. Tokyo, vol. 19, p. 589, Text figs. 1–5. Permian, Hainan, Indochina.
Polymorphina sp. Kline, Mississippi State Geol. Surv., Bull. 53, p. 41, pl. 4, fig. 9. Paleocene, Mississippi.
Polystomella sp. sp. Ruiz de Gaona, Bol. R. Soc. Espan. Hist. Nat., vol. 41, p. 101, pl. 1, figs. 34–36. Maestrichtian, Spain.
Pseudoschwagerina sp. Toriyama and Minato, Jour. Geol. Soc. Japan, vol. 50, No. 601, p. 264, text figs. 1, 2. Carboniferous, Manchuria.
Pullenia nov. sp. van Wessem, Thesis Univ. Utrecht, p. 47, pl. 1, figs. 52, 53. Upper Cretaceous, Cuba.
Robulus sp. van Wessem, *ibid.*, p. 41, pl. 1, figs. 14, 15. Upper Cretaceous, Cuba.
Sigmomorphina sp. Kline, Mississippi State Geol. Surv., Bull. 53, p. 41, pl. 4, fig. 6. Paleocene, Mississippi.
Textulariella sp. van Wessem, Thesis Univ. Utrecht, p. 31, pl. 1, fig. 5. Upper Cretaceous, Cuba.
Valvulineria nov. sp. van Wessem, *ibid.*, p. 47, pl. 1, figs. 49–51. Upper Cretaceous, Cuba.
Verneuilina nov. sp. van Wessem, *ibid.*, p. 51, pl. 2, figs. 24, 25. Oligo-Miocene, Cuba.

NOMINA NUDA

The following *nomina nuda* were seen in the literature for the year 1943:
Elphidium rutteni Hermes, in van Wessem, Thesis Univ. Utrecht, p. 51. Lower Oligocene, Cuba. (Note: This species was validated in 1945, see Index for the year 1945, *ut supra.*)
Helicolepidina spiralis Tobler, 1922, var. *trinitatis* Brönnimann, Eclog. geol. Helv., vol. 36,

p. 258. Eocene, Trinidad. (Note: This variety was validated in 1944, see Supplement for the year 1944, *ut infra*.)

ORBITOCYCLINOIDES subgen. nov. Brönnimann, *ibid.*, vol. 36, p. 258. Upper Cretaceous, Iran, with subgenotype: *Orbitocyclina* (*Orbitocyclinoides*) *schencki* Brönnimann, *ibid.*, vol. 36, p. 258. Upper Cretaceous Iran. (Note: Subgenus and subgenotype were validated in 1944, see Supplement to Index for the year 1944, *ut infra*.)

SUPPLEMENT FOR THE YEAR 1944

Ammobaculites praelonga ten Dam, Mededeel. Geol. Stichting Haarlem, (C), vol. 5, No. 3, p. 80, pl. 6, fig. 9. Paleocene (brack-water), Holland.

Angulogerina ikebei Husezima and Maruhasi, Jour. Sigen. Ken., vol. 1, No. 3, p. 396, pl. 34, fig. 8. Pliocene, Japan.

Anomalina berthelini nom. nov. ten Dam Comptes Rendus Soc. géol. France, fasc. 10, p. 105, Albian, Holland. New name for: *Anomalina complanata* Berthelin, 1880 (non Reuss, 1851), Mém. Soc. géol. France, (3), vol. 1, p. 66, pl. 4, figs. 12, 13.

Bulimina trigonalis ten Dam, Mededeel. Geol. Stichting Haarlem, (C), vol. 5, No. 3, p. 112, pl. 3, figs. 16, 17. Paleocene, Holland. (Note: *cave Bulimina trigona* Terquem, 1882, and *Bulimina trigonula* Chapman, 1904.)

Cassidulina kasiwazakiensis Husezima and Maruhasi, Jour. Sigen. Ken., vol. 1, No. 3, p. 399, pl. 34, fig. 13. Pliocene, Japan.

Ceratobulimina inflata ten Dam, Mededeel. Geol. Stichting Haarlem, (C), vol. 5, No. 3, p. 124, pl. 4, fig. 5. Lutetian, Holland.

Cibicides anomalinoides ten Dam, *ibid.*, vol. 5, No. 3, p. 132, pl. 5, fig. 7. Bartonian, Holland.

——— *crassus* ten Dam, *ibid.*, vol. 5, No. 3, p. 133, pl. 6, fig. 1. Ypresian, Holland.

——— *cryptomphalus* (Reuss, 1850) var. *aculimargo* ten Dam, *ibid.*, vol. 5, No. 3, p. 133, pl. 5, fig. 4. Lutetian, Holland.

——— *reinholdi* ten Dam, *ibid.*, vol. 5, No. 3, p. 135, pl. 5, fig. 6. Paleocene, Holland.

——— *ypresiensis* ten Dam, *ibid.*, vol. 5, No. 3, p. 136, pl. 6, fig. 2. Ypresian, Holland.

Cristellaria (*Lenticulina*) *hartingi* ten Dam, *ibid.*, vol. 5, No. 3, p. 90, pl. 3, fig. 1. Paleocene Holland.

——— (*Robulus*) *angustistoma* ten Dam, *ibid.*, vol. 5, No. 3, p. 89, pl. 3, fig. 7. Paleocene, Holland. For: *Cristellaria* (*Robulina*) *trigonostoma* Franke, 1927 (non Reuss, 1851), Danmarks geol. Unders., vol. 2, No. 46, p. 31, pl. 3, fig. 6.

——— (———) *globulosa* ten Dam, *ibid.*, vol. 5, No. 3, p. 88, pl. 3, fig. 2. Paleocene, Holland. [Note: *cave Cristellaria* (*Marginulina*) *globosa* Hantken, 1868, and *Cristellaria globosa* Zwingli and Kübler, 1870.]

Cymbalopora hemiglobosa ten Dam, *ibid.*, vol. 5, No. 3, p. 123, pl. 6, figs. 3, 4. Paleocene, Holland.

DANUBICA gen. nov. Frentzen, Palaeont. Zeitschr., vol. 23, p. 325. Family (not known to the compiler). Genotype: *Danubica gracilis* Frentzen, 1944, *ut infra*. Upper Jurassic, basal Malm.

——— *gracilis* Frentzen, *ibid.*, vol. 23, p. 325, pl. 17, figs. 10 B, a, M, i. Basal Malm (Upper Jurassic), Germany.

——— *robusta* Frentzen, *ibid.*, vol. 23, p. 325, pl. 17, figs. 11, 12. Basal Malm (Upper Jurassic), Germany.

Dentalina frankei nom. nov. ten Dam, Mededeel. Geol. Stichting Haarlem, (C), vol. 5, No. 3, p. 92, pl. 2, fig. 15. Paleocene, Holland. For: *Dentalina multilineata* Reuss, 1871 (non Bornemann, 1855), Palaeontogr., vol. 20, No. 1, p. 83, pl. 20, fig. 3; and for: *Dentalina multilineata* Franke, 1928 (non Bornemann, 1855, non Reuss, 1871), Abhandl. Preuss. Geol. Landes-Anst. Berlin, vol. 111, p. 40, pl. 3, fig. 24.

——— *glaessneri* ten Dam, *ibid.*, vol. 5, No. 3, p. 92, pl. 2, fig. 11. Paleocene, Holland.

Discorbis nipponica Husezima and Maruhasi, Jour. Sigen. Ken., vol. 1, No. 3, p. 397, pl. 34, fig. 9. Pliocene, Japan.

Elphidium etigoense Husezima and Maruhasi, *ibid.*, vol. 1, No. 3, p. 392, pl. 34, fig. 1. Pliocene, Japan.

——— *planum* Husezima and Maruhasi, *ibid.*, vol. 1, No. 3, p. 392, pl. 34, fig. 2. Pliocene, Japan.

——— *primum* ten Dam, Mededeel. Geol. Stichting Haarlem, (C), vol. 5, No. 3, p. 109, pl. 3, fig. 15. Paleocene, Holland.

——— *rarum* Husezima and Maruhasi, Jour. Sigen. Ken., vol. 1, No. 3, p. 393, pl. 34, fig. 3. Pliocene, Japan.

——— *suzukii* Husezima and Maruhasi, *ibid.*, vol. 1, No. 3, p. 394, pl. 34, fig. 4. Pliocene, Japan.

EPISTOMINELLA gen. nov. Husezima and Maruhasi, *ibid.*, vol. 1, No. 3, p. 397. Family not given. Genotype: *Epistominella pulchella* Husezima and Maruhasi, 1944, *ut infra*. Pliocene.

——— *pulchella* Husezima and Maruhasi, *ibid.*, vol. 1, No. 3, p. 398, pl. 34, fig. 10. Pliocene, Japan.

Eponides gracillimus ten Dam, Mededeel. Geol. Stichting Haarlem, (C), vol. 5, No. 3, p. 119, pl. 4, fig. 8. Paleocene, Holland.

——— *niigataensis* Husezima and Maruhasi, Jour. Sigen. Ken., vol. 1, No. 3, p. 398, pl. 34, fig. 11. Pliocene, Japan.

——— *rotundus* Husezima and Maruhasi, *ibid.*, vol. 1, No. 3, p. 399, pl. 34, fig. 12. Pliocene or Pleistocene, Japan.

Flabellina coranica Marie, Bull. Soc. géol. France, (5), vol. 14, p. 402, text figs. 11–16 (fig. 15: holotype). Danian, Morocco. (Published December 1945.) (Note: This species has to be placed with the genus *Palmula*.)

——— *lacostei* Marie, *ibid.*, vol. 14, p. 401, text figs. 8–10 (fig. 9: holotype). Upper Maestrichtian, Morocco. (Published December 1945.)

(Note: This species is to be placed into the genus *Palmula*.)

Glandulina nitida ten Dam, Mededeel. Geol. Stichting Haarlem, (C), vol. 5, No. 3, p. 107, pl. 3, fig. 9. Paleocene, Holland.

Globotruncana alpina Bolli, Eclog. geol. Helv., vol. 37, p. 224, text fig. 1, Nrs. 5–7; pl. 9, figs. 3, 4. Upper Cenomanian, Swiss Alps. (Published February 1945.) For: *Globotruncana appeninica* Tschachtli, 1941 (non Renz, 1936), Thesis Univ. Bern, p. 59, text fig. 12, specimen in center.

——— *helvetica* Bolli, *ibid.*, vol. 37, p. 226, text fig. 1, Nrs. 9–12; pl. 9, figs. 6–8. Cenomanian-Turonian boundary, Swiss Alps. (Published February 1945.)

——— *lapparenti* Brotzen, 1936, subsp. *coronata* Bolli, *ibid.*, vol. 37, p. 233, text fig. 1, Nrs. 21, 22; pl. 14, pl. 15. Upper Turonian-Lower Santonian, Swiss Alps. (Published February 1945.) For: *Rosalina linnei type 4*, de Lapparent, 1918, Terr. Hendaye, Mém. Explic. Carte géol. France, p. 4, text fig. 1-g; for: *Globotruncana linnei* (d'Orb.) in Tschachtli, 1941, Thesis Univ. Bern. p. 20, text fig. 1-e; for: *Globotruncana linnei marginata* (Reuss) in Vogler, 1941, Palaeontogr., Suppl.-Bd. 4, Lief. 4, pl. 24, fig. 17; and for: *? Rosalinella lapparenti* Marie, 1941, Mém. Mus. Nation. Hist. Nat. Paris, n.s., vol. 12, fasc. 1, pl. 36, fig. 341.

——— ——— ——— subsp. *inflata* Bolli, *ibid.*, vol. 37, p. 230, text fig. 1, Nrs. 13, 14; pl. 9, figs. 14, 15. Basal Turonian, Swiss Alps. (Published February 1945.)

——— ——— ——— subsp. *lapparenti* Bolli, *ibid.*, vol. 37, p. 230, text fig. 1, Nrs. 15, 16; pl. 9, fig. 11. Turonian-Campanian, Swiss Alps. (Published February 1945.) For: *Rosalina linnei type 1* de Lapparent, 1918, Mém. Explic. Carte géol. France, Hendaye, p. 4, text fig. 4 a and c; for: *Globotruncana linnei* (d'Orb.) in Renz, 1936, Eclog. geol. Helv., vol. 29, pl. 6, figs. 32–34; for: *Globotruncana linnei* (d'Orb.) in Tschachtli, 1941, Thesis Univ. Bern. p. 20, text fig. 1-g; for: *Globotruncana linnei typica* in Vogler, 1941, Palaeontogr., Suppl.-Bd. 4, Lief. 4, pl. 23, figs. 12–21; and for *Globotruncana linnei* (d'Orb.) in Gandolfi, 1942, Riv. Ital. Paleont., vol. 48, Mem. 4, pl. 3, fig. 3; pl. 5, figs. 18, 32 and 33. [Note: The varietal name is preoccupied by *Globotruncana lapparenti* Brotzen, 1936, and also by *Rosalinella* (*Globotruncana*) *lapparenti* Marie, 1941, *ut supra*.].

——— *leupoldi* Bolli, *ibid.*, vol. 37, p. 235, text fig. 1, Nrs. 25, 26; pl. 9, fig. 17. Campanian-Maestrichtian, Swiss Alps. For: *Rosalina linnei type 5* de Lapparent, 1918, Mém. Explic. Carte géol. France, Hendaye, p. 5, text fig. 2-f (?2-h); p. 13, text fig. 5-a; for: *Globotruncana linnei stuarti* Vogler, 1941, Palaeontogr., Suppl.-Bd. 4, Lief. 4, pl. 24, figs. 9, 11; and for: *Globotruncana linnei marginata* in Vogler, 1941, *loc. cit.*, pl. 24, fig. 25.

Globulina laeviglobosa ten Dam, Mededeel. Geol. Stichting Haarlem, (C), vol. 5, No. 3, p. 107, pl. 1, fig. 1. Paleocene, Holland.

Gyroidina angustiumbilicata ten Dam, *ibid.*, vol. 5, No. 3, p. 117, pl. 4, fig. 7. Paleocene, Holland.

HANZAWAIA gen. nov. Asano, Jour. Geol. Soc. Japan, vol. 51, No. 606, p. 98. Family Rotaliidae. Genotype: *Hanzawaia nipponica* Asano, 1944, *ut infra*. Pliocene.

——— *nipponica* Asano, *ibid.*, vol. 51, No. 606, p. 99, pl. 4, figs. 1, 2. Pliocene, Japan.

Helicolepidina spiralis Tobler, 1922, var. *trinitatis* Brönnimann, Abhandl. Schweiz. Palaeont. Ges., vol. 64, p. 22, pl. 3, figs. 20, 21; text figs. 6 (holotype), 7, 11, 12 14-c. Upper Eocene, Trinidad, B.W.I.

Lenticulina see *Cristellaria*.

Marginulina acuticauda ten Dam, Mededeel. Geol. Stichting Haarlem, (C), vol. 5, No. 3, p. 97, pl. 2, fig. 21. Paleocene, Holland.

——— *costifera* ten Dam, *ibid.*, vol. 5, No. 3, p. 97, pl. 2, fig. 22. Paleocene, Holland.

Nodosaria torsicostata ten Dam, *ibid.*, vol. 5, No. 3, p. 96, pl. 2, fig. 16. Palaeocene, Holland. For: *Nodosaria* aff. *raphanistrum* Linn. in Staesche and Hiltermann, 1940, Abhandl. Reichsanst. f. Bodenforsch. Berlin, n.s., vol. 201, p. 11, pl. 1, fig. 2.

Nonion acutidorsatum ten Dam, *ibid.*, vol. 5, No. 3, p. 108, pl. 3, fig. 19. Lutetian, Holland.

——— *katayamai* Husezima and Maruhasi, Jour. Sigen. Ken., vol. 1, No. 3, p. 394, pl. 34, figs. 5 a, b. Pliocene, Japan.

——— *oyamai* Husezima and Maruhasi, *ibid.*, vol. 1, No. 3, p. 395, pl. 34, fig. 6. Pliocene, Japan.

——— *sublaeve* ten Dam. Mededeel. Geol. Stichting Haarlem, (C), vol. 5, No. 3, p. 109, pl. 3, fig. 8. Paleocene (brackwater), Holland.

Nonionella umekae Husezima and Maruhasi, Jour. Sigen. Ken., vol. 1, No. 3, p. 395, pl. 34, fig. 7. Pliocene, Japan.

ORBITOCYCLINOIDES subgen. nov. Brönnimann, Abhandl. Schweiz. Palaeont. Ges., vol. 64, p. 5. New subgenus of *Orbitocyclina* Vaughan, 1929. Family Orbitoididae. Subgenotype: *Orbitocyclina* (*Orbitocyclinoides*) *schencki* Brönnimann, 1944, *ut infra*. Upper Cretaceous.

Orbitocyclina (*Orbitocyclinoides*) *schencki* Brönnimann, *ibid.*, vol. 64, p. 5, pl. 1, figs. 1–7; pl. 2, figs. 10–12, 14 (holotype), 15; text figs. 1, 3, 4. Upper Cretaceous, Iran.

Polymorphina costulata ten Dam, Geologie en Mijnbouw, vol. 6, p. 44, text figs. 1, 2. Middle Miocene, Holland. For: *Frondicularia sp.* ten Dam and Reinhold, 1942, Mededeel. Geol. Stichting Haarlem, (C), vol. 5, No. 2, p. 66, pl. 9, fig. 19.

Pseudoglandulina trottola ten Dam, Mededeel. Geol. Stichting Haarlem, (C), vol. 5, No. 3, p. 96, pl. 2, fig. 14. Paleocene, Holland.

Pseudoschwagerina taiensis Toriyama, Japan. Jour. Geol. and Geogr. vol. 19, p. 245, pl. 26, figs. 4–7. Sakmarian, Siam.

Renulina cretacea Pérébaskine, Bull. Soc. Hist. Nat. Toulouse, vol. 79, p. 71, text fig. 1. Cenomanian, France.
Robulus see *Cristellaria*.
Rotalia granulosa ten Dam, Mededeel. Geol. Stichting Haarlem, (C), vol. 5, No. 3, p. 121, pl. 4, fig. 2. Bartonian, Holland. [Note: Preoccupied by *Rosalina* (*Rotalia*) *granulosa* Karrer, 1865, Sitzber. k. Akad. Wiss. Wien, vol. 1, (1), 1864 (1865), p. 710, pl. 2, fig. 14.]
——— *parvula* ten Dam, *ibid.*, vol. 5, No. 3, p. 121, pl. 4, fig. 1. Paleocene, Holland.

Saabrookia lagenoides ten Dam, *ibid.*, vol. 5, No. 3, p. 127, pl. 3, fig. 18. Bartonian, Holland.
Siphonina obliquecamerata ten Dam, *ibid.*, vol. 5, No. 3, p. 122, pl. 6, fig. 7. Paleocene, Holland.
SUBBDELLOIDINA gen. nov. Frentzen, Palaeont. Zeitschr., vol. 23, p. 331. Family (not known to the compiler). Genotype: *Bdelloidina aggregata* Haeusler, 1890 (non Carter, 1877), Abhandl. Schweiz. Palaeont. Ges., vol. 17, p. 43, pl. 4, fig. 23. Basal Malm (Upper Jurassic).
——— *haeusleri* Frentzen, *ibid.*, vol. 23, p. 331, pl. 18, figs. 12–22. Basal Malm (Upper Jurassic), Germany.

Thurammina glabra ten Dam, Mededeel. Geol. Stichting Haarlem, (C), vol. 5, No. 3, p. 73, pl. 6, fig. 5. Lutetian, Holland.
Turrilina brevispira ten Dam, *ibid.*, vol. 5, No. 3, p. 110, pl. 3, fig. 14. Ypresian, Holland.

Vaginulinopsis praelonga ten Dam, *ibid.*, vol. 5, No. 3, p. 102, pl. 6, fig. 8. Ypresian, Holland.
Valvulineria gracillima ten Dam, nom. nov., Comptes Rendus Soc. Géol. France, fasc. 10, p. 105. Albian, Holland. New name for: *Rotalia nitida* Chapman (?), (non Reuss, 1844) [insufficiently documented by ten Dam]; and for: *Placentula nitida* Berthelin, 1880 (non Reuss, 1844, *Rotalina*), Mém. Soc. géol. France, (3), vol. 1, p. 69, pl. 4, fig. 11.

FORMS WITH NOMENCLATURA APERTA

Fusulina sp. Toriyama, Japan. Jour. Geol. and Geogr., vol. 19, p. 76, pl. 6, fig. 17. Permian. Japan.
Fusulinella sp. Toriyama, *ibid.*, vol. 19, p. 74, pl. 6, fig. 13. Permian, Japan.
Haplophragmoides species ten Dam, Mededeel. Geol. Stichting Haarlem, (C), vol. 5, No. 1, p. 80, pl. 2, fig. 25. Paleocene (brackwater), Holland.
Lamarckina species ten Dam, *ibid.*, vol. 5, No. 3, p. 117, pl. 4, fig. 9. Age not given (probably Upper Eocene), Holland.
Marginulina species ten Dam, *ibid.*, vol. 5, No. 3, p. 98, pl. 2, fig. 20. Paleocene, Holland.
——— *species* (*nov. spec. ?*) ten Dam, *ibid.*, vol. 5, No. 3, p. 99, pl. 6, fig. 6. Ypresian, Holland.
Pseudoschwagerina (*?*) *sp.* Toriyama, Japan. Jour. Geol. and Geogr., vol. 19, p. 246, pl. 26, fig. 4. Permian, Siam.
Schwagerina sp. Toriyama, *ibid.*, vol. 19, p. 80, pl. 6, fig. 25. Permian, Japan.

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ADDENDA (1942–1945)

At the time the galley-proofs were submitted for correction to the compiler (in April 1947) several new genera and species of Foraminifera had come to his attention. Cordial thanks are due to Dr. Joseph A. Cushman for his courtesy in making available the papers by R. Selli and L. Majzon, and to Dr. Alfredo Silvestri for reprints of his papers on Foraminifera published during the war-years.

YEAR 1942

Adelosina procera. A. Silvestri, *Adelosina zangherii* A. Silvestri, and *Quinqueloculina placenta* A. Silvestri, cited above in SUPPLEMENT TO INDEX FOR THE YEAR 1942, are to be supplemented, respectively, with the following exact bibliographic references: p. 71, text figs. 1 a–c; p. 72, text figs. 2 a–c; and p. 74, text figs. 3 a–c. All three species are from the Pliocene, Italy.
Biloculina williamsoni Silvestri and Zangheri, nom. nov., Boll. Soc. geol. Ital., vol. 61, p. 70. Pliocene, Italy. New name for: *Biloculina ringens* (Lamarck, 1804), var. *typica* in Williamson, 1858, Recent British Foram., p. 78 (not p. 18), pl. 6, figs. 169, 170; pl. 7, fig. 171 (nec figs. 172–176); and for: *Biloculina inornata* Silvestri, 1901 (non d'Orbigny, 1846), Atti e Rendic. R. Accad. Sci., Lett. e Arti Acireale, new series, vol. 10, p. 19, pl. 1, fig. 7. (Note: Preoccupied by *Biloculina williamsoni* Silvestri, 1923, Atti Accad. Pont. Romana Nuovi Lincei, vol. 76, p. 73 for exactly the same reference in Williamson, 1858).
Bolivina karreriana Brady, 1881, var. *interrupta* Silvestri and Zangheri, *ibid.*, vol. 61, p. 87. Onomatype. Pliocene, Italy. For: *Bolivina karreriana* Brady, 1881, in Brady, 1884, Rept. Foram. Challenger, p. 424, pl. 53, figs. 19–21; and for same reference in Cushman, 1911, U. S. Nat. Mus., Bull. 71, pt. 2, p. 40, text fig. 65. [Note: Brady's *Bolivina karreriana* (1881), figured in 1884, is a well-established type-species and, therefore, can not be put into synonymy with the variety *interrupta* by Silvestri and Zangheri.]
Discorbina orbicularis (Terquem, 1876) var. *limbata* Silvestri and Zangheri, *ibid.*, p. 91. Onomatype. Pliocene, Italy.
Nummulites budensis Hantken, 1875, var. *crassa* Silvestri, Palaeontogr. Italica, vol. 32, Suppl. 5, Paleontologia della Somalia, p. 20 (200), pl. 20, fig. 3. Upper Lutetian, Somalia. For: *Nummulites semicostata* Uhlig, 1886 (non Kaufmann, 1867), Jahrb. k. k. Geol. Riechsanst. Wien, vol. 36, p. 207, text fig. 13; for *Nummulites jonica* Martelli, 1901, Boll. Soc. geol. Ital., vol. 20, p. 428, pl. 7, figs. 8, 9; for: *Lenticulina budensis* (Hantken) in Checchia-Rispoli, 1904, Boll. Soc. geol. Ital., vol. 23, p. 52, pl. 2, fig. 2.; for: *Paronaea sub-budensis* Prever in Parisch, 1907, Mem. R. Acad. Sci. Torino, vol. 57, p. 85, pl. 2, figs. 12; and for: *Hantkenia budensis* (Hantken) in Ravagli, 1908, Rendic. R. Accad. Lincei, Boll. Sci. Fis., Mat. e Nat., (5), vol. 17, p. 129. [Note: The

varietal name is preoccupied by *Nummulina* (*Nummulites*) *crassa* Boubée, 1833, Bull. Hist. Nat. France, (5), Nr. M, p. 6; figured by d'Archiac, 1848, Mém. Soc. géol. France, (2), vol. 3, p. 415, pl. 9, figs. 16 B, B-1, B-2, and B-3.]

Rotalia? maculata Silvestri, ibid., vol. 32, Suppl. 5, p. 73 (253), pl. 29, figs. 1–3. Upper Lutetian, Somalia. (Note: Preoccupied by Stache, 1864, Novara-Exped., Geol. Theil I, p. 278, pl. 24, fig. 28.)

Spirillina terquemi Silvestri and Zangheri, nom. nov., Boll. Soc. geol. Ital., vol. 61, p. 67. Pliocene, Italy. New name for: *Spirillina margaritifera* Terquem, 1881 (non Williamson, 1858), Ess. Anim. Plage Dunkerque, pt. 3, p. 110, pl. 13, figs. 2 a, b. (Note: This change of name has already been made by Silvestri in 1923, based on the same reference in Terquem, 1881. See: A. Silvestri, 1923, Atti Accad. Pont. Romana Nuovi Lincei, vol. 76, p. 72.)

The following forms with *nomenclatura aperta* are listed in Montanaro-Gallitelli, Palaeontogr. Italica, vol. 40, (new series vol. 10), anno 1940–1941, Pisa, 1942:

Gypsina sp. Montanaro-Gallitelli, p. 74, pl. 11, figs. 3, 6; pl. 12, fig. 2. Miocene (Sahelian), Eritrea.

Lepidocyclina?? sp. indet. Montanaro-Gallitelli, p. 75, pl. 11, fig. 5. Miocene (Sahelian), Eritrea; and

Rotalia sp. Montanaro-Gallitelli, p. 73, pl. 12, figs. 1, 6. Miocene (Sahelian), Eritrea.

A. Silvestri, in Rendic. R. Acad. Italia, Classe Sci. fis., mat. e nat., (7), vol. 3, 1941, Roma, 1942, on pp. 319, 320, and 321, lists the following *nomina nuda* from the Venetian Lagoon (without description or figures):

Discorbina lacunae
Polystomella intermedia
Pulvinulina lateralis (Terquem) var. *lacunae*
Spiroloculina nitida d'Orbigny var. *dilatata*, and
——— ——— ——— var. *chordata*.

This additional list brings the total of new forms for the year 1942 to 3 families, 2 subfamilies, 20 genera, 5 subgenera, 251 species, 44 varieties, 9 *nomina nova*, 10 *nomina nuda*, 20 homonyms, and 119 forms with *nomenclatura aperta*.

YEAR 1943

Ammodiscus eggeri Majzon, nom. nov., A Magy. Kir. Földtani Int. Evkönyve, vol. 37, Nr. 1, p. 64, pl. 2, fig. 6. Upper Cretaceous, Hungary. New name for: *Ammodiscus gaultinus* Egger, 1899 (non Berthelin, 1880), Abhandl. k. Bayer, Akad. Wiss. München, Math.-Nat. Classe, vol. 21, p. 16, pl. i figs. 1, 2, 9.

Cyclammina subkarpatica Majzon, nom. nov., *ibid.*, vol. 37, Nr. 1, p. 67, pl. 2, fig. 8. Upper Cretaceous, Hungary. New name for: *Cyclammina pusilla* Brady, 1881, var. *draga* Liebus and Schubert, 1902, Jahrb. k. k. geol. Reichsanst. Wien, vol. 52, p. 286, pl. 15, fig. 3; for: *Haplophragmoides acuticostatum* (Hantken) in Nuttal, 1930, Jour. Paleontology, vol. 4, p. 279, pl. 23, figs. 2, 3; and for: *Trochammina trinitatensis* Cushman and Jarvis, 1929, Contr. Cushman Lab. Foram. Research, vol. 4, p. 95, pl, 13, fig. 13.

Glomospira saturniformis Majzon, nom. nov., *ibid.*, vol. 37, No. 1, p. 65, pl. 2, fig. 9. Upper Cretaceous, Hungary. New name for: *Ammodiscus charoides* Jones and Parker, in Grzybowski, 1898, Rozpr. Akad. Umijet. Krakowie, vol. 33, p. 284, pl. 10, fig. 26; and for same reference in Schubert, 1899, Lotos, Prag, p. 21, pl. 5, fig. 9.

Haplophragmoides loczyi Majzon, *ibid.*, vol. 37, Nr. 1, p. 66, pl. 2, fig. 13. Upper Cretaceous, Hungary.

Nodosarella (?) brevis Majzon, *ibid.*, vol. 37, Nr. 1, p. 73, pl. 2, fig. 11. Upper Cretaceous, Hungary.

PLACENTAMMINA gen. nov. Majzon, 1940, in Majzon, *ibid.*, vol. 37, Nr. 1, p. 62. Family Saccamminidae. Genotype: *Reophax placenta* Grzybowski, 1898, Rozpr. Akad. Umijet. Krakowie, vol. 33, p. 276, pl. 10, figs. 9, 10. Uppermost Cretaceous.

——— *gutta* Majzon, nom. nov. *ibid.*, vol. 37, Nr. 1, p. 63, pl. 2, fig. 5. Uppermost Cretaceous, Hungary. New name for: *Reophax difflugiformis* Friedberg, 1901 (non Brady, 1879), Rozpr. Akad. Umijet. Krakowie, p. 628, pl. i, figs. 6 b, c, e.

PLEUROSTOMELLOIDES gen. nov. Majzon, 1941, in Majzon, *ibid.*, vol. 37, Nr. 1, p. 67. Family Textulariidae. Genotype: *Pleurostomelloides andreasi* Majzon, 1943, *ut infra*. Uppermost Cretaceous.

——— *andreasi* Majzon, *ibid.*, vol. 37, Nr. 1, p. 67, pl. 2, fig. 10. Uppermost Cretaceous, Hungary.

THALMANNINA gen. nov. Majzon, 1941, in Majzon, *ibid.*, vol. 37, Nr. 1, p. 64. Family Ammodiscidae. Genotype: *Thalmannina nothi* Majzon, 1943, *ut infra*. Uppermost Cretaceous. (*Cave: Thalmannia* Le Roy, 1939, Ostracoda).

——— *nothi* Majzon, nom. nov., *ibid.*, vol. 37, Nr. 1, p. 65, pl. 2, fig. 14. Uppermost Cretaceous, Hungary. New name for: *Ammodiscus cf. fallax* Grzybowski in Noth, 1912, Beitr. Paläont. u. Geol. Oesterreich-Ungarns u. Orients, vol. 25, p. 12, pl. 1, fig. 12.

Trochamminoides körösmezöensis Majzon, *ibid.*, vol. 37, Nr. 1, p. 66, pl. 2, fig. 16. Upper Cretaceous Hungary.

——— *transitus* Majzon, *ibid.*, vol. 37, Nr. 1, p. 65, pl. 2, fig. 12. Upper Cretaceous, Hungary.

UVIGERINAMMINA gen. nov. Majzon, 1941, in Majzon, *ibid.*, vol. 37, Nr. 1, p. 68. Family: not given (Verneuilinidae ?). Genotype: *Uvigerinammina jankói* Majzon, 1943, *ut infra*, Uppermost Cretaceous.

——— *jankói* Majzon, *ibid.*, vol. 37, Nr. 1, p. 68, pl. 2, fig. 15. Uppermost Cretaceous, Hungary.

With these additions the total of new forms for the year 1943 is, as follows: 11 genera, 172 species, 31 varieties, 7 *nomina nova*, 4 homonyms, 3 *nomina nuda*, and 78 forms with *nomenclatura aperta*.

YEAR 1944

Bolivina capdevilensis Cushman and Bermudez, 1937 var. *gortanii* Selli, Giorn. di Geol. Bologna,

(2), vol. 17, p. 56, pl. 1, fig. 13. Upper Lutetian, Apennines, Italy.

Bulimina abatissae Selli, *ibid.*, (2), vol. 17, p. 58, pl. 1, fig. 15. Upper Lutetian, Apennines, Italy.

Clavulina (*Clavulinoides*) *fantinii* Selli, *ibid.*, (2), vol. 17, p. 39, pl. 1, fig. 2. Upper Lutetian, Apennines, Italy.

Ellipsopleurostomella labiata (Schwager, 1866) var. *fantinii* Selli, *ibid.*, (2), vol. 17, p. 70, pl. 2, figs. 3, 4 Upper Lutetian, Apennines, Italy.

——— *Schlichti* A. Silvestri, 1903, var. *silvestri* Selli, *ibid.*, (2), vol. 17, p. 69, pl. 2, figs. 1, 2. Upper Lutetian, Apennines, Italy.

Gaudryina (*Pseudogaudryina*) *claternae* Selli, *ibid.*, (2), vol. 17, p. 41, pl. 1, figs. 3, 4. Upper Lutetian, Apennines, Italy.

Lagena gortanii Selli, *ibid.*, (2), vol. 17, p. 53, pl. 1, fig. 12. Upper Lutetian, Apennines, Italy.

——— *scarenaensis* Hantken, 1883, var. *depressula* Selli, *ibid.*, (2), vol. 17, p. 52, pl. 1, fig. 10. Upper Lutetian, Apennines, Italy.

——— ——— ——— var. *glabrata* Selli, *ibid.*, (2), vol. 17, p. 53, pl. 1, fig. 11. Upper Lutetian, Apennines, Italy.

Nodosaria boffalorae Martinotti, 1923, var. *fantinii* Selli, *ibid.*, (2), vol. 17, p. 49, pl. 1, fig. 6. Upper Lutetian, Apennines, Italy.

Pulvinulina abatissae Selli, *ibid.*, (2), vol. 17, p. 81, pl. 2, figs. 13–15. Upper Lutetian, Apennines, Italy.

Nodosaria n.sp. Selli, *ibid.*, (2), vol. 17, p. 49, pl. 1, fig. 8. Upper Lutetian, Apennines, Italy.

Planularia n.sp. Selli, *ibid.*, (2), vol. 17, p. 44, pl. 1 fig. 5. Upper Lutetian, Apennines, Italy.

This brings the total of new Foraminifera for the year 1944 to 14 genera, 1 subgenus, 239 species, 40 varieties, 10 *nomina nova*, 15 *nomina nuda*, 8 homonyms, and 99 forms with *nomenclatura aperta*.

MANUSCRIPT RECEIVED APRIL 12, 1947.

YEAR 1945

Nummulites anomala de la Harpe, 1877, var. *granulosa* de Cizancourt, 1945, Bull. Soc. géol. France, (5), vol. 15, (published November 13, 1946), p. 651, pl. 10, figs. 15–19. No age given. (Eocene, Aquitaine, France). [Note: The varietal name is preoccupied by *Nummulina granulosa* d'Archiac, 1847, Bull. Soc. géol. France, (2) vol. 4, p. 1010, figured as *Nummulites granulosa* d'Archiac, in d'Archiac and Haime, 1853, Descr. Anim. Groupe Nummulitique Indes, vol. 1, p. 151, pl. 10, figs. 11–19; pl. 4, fig. 15.]

——— *bironensis* de Cizancourt, *ibid.*, (5), vol. 15 (published Nov. 13, 1946), p. 653, pl. 10, figs. 20–23. No age given. (Eocene, Aquitaine, France).

——— *fossulata* de Cizancourt, nom. nov., *ibid.*, (5), vol. 15 (published Nov. 13, 1946), p. 654-*bis*. New name for: *Nummulites umbilicata* de Cizancourt, 1945, (non L. Rutten, 1915), *ut infra*.

——— *umbilicata* de Cizancourt, *ibid.*, (5), vol. 15, (published Nov. 13, 1946), p. 644, pl. 10, figs. 6–8; text fig. 1. No age given. (Eocene, Aquitaine, France). [Note: In a post-script, p. 654-*bis;* Madame de Cizancourt changes the name of this species to *Nummulites fossulata* (*ut supra*), on account of homonymy with *Nummulites* (*Assilina*) *umbilicata* L. Rutten, 1915, Verhandl. Jaarb. Mijnwezen Batavia, pt. 2, p. 60, text figs. 32–36.]

The total of new forms for the year 1945, so far, is as follows: 7 superfamilies, 4 families, 3 subfamilies, 21 genera, 3 subgenera, 295 species, 71 varieties, 6 *nomina nova*, 7 *nomina nuda*, 7 homonyms (of which 3 were subsequently renamed) and 125 forms with *nomenclatura aperta*.

JOURNAL OF PALEONTOLOGY, VOL. 21, NO. 4, PP. 396–399, JULY 1947

PALEONTOLOGICAL NOTES

A NEW SPECIES OF ASTERIGERINA FROM THE UPPER LIASSIC OF ENGLAND

A. TEN DAM
Relizane, Algeria

ABSTRACT—During the course of a monographic study of the foraminiferal genus *Epistomina*, samples received from Mr. Macfadyen from the upper Liassic of England were found to contain numerous specimens of *Asterigerina* that had been mistaken for an *Epistomina*.

Family AMPHISTEGINIDAE
Genus ASTERIGERINA
ASTERIGERINA MACFADYENI
ten Dam, n. sp.
Figures 1 a–c

TEST rounded, planoconvex to slightly biconvex. Peripheral margin sharp, limbate, slightly lobulate. Number of whorls visible on dorsal side 3 to 3½ in well developed specimens. Chambers eight in final volution. Dorsal side convex to strongly convex, chambers slightly depressed between raised sutural ridges which are moderately curved, limbate, and connected peripherally with a limbate marginal keel. Ventral side flattened to very slightly convex, smooth or almost smooth, with stellar alternating chambers, not reaching the periphery, so that dorsal chambers form more than two thirds of ventral surface; sutures flush with surface or very slightly depressed near periphery, limbate; central portion occupied by hyaline imperforate umbilical plate. Dorsal or ordinary chambers with aperture on ventral side, an arched radial slit surrounded by granular ornamentation. Dorsal and ventral stellar alternating chambers connected by aperture, only shown in broken or young specimens, consisting of an elongate slit in plane of of coiling, with phialine lip. Ventral surface of dorsal chambers finely perforate, surface of stellar chambers more coarsely perforate. Dorsal side regularly and finely perforate.

FIGS. *1a-c*—Ventral, edge, and dorsal views of *Asterigerina macfadyeni* ten Dam, n. sp. X 88.

Maximum diameter.—0.45 mm.

Holotype.—ten Dam Coll. no. A. 386.

Occurrence.—Rather common in the *Hildoceras bifrons* zone (Whitbian) of the Upper Liassic, as encountered to a depth of 37 feet in a boring at Pattishall, near Northhampton (type locality), and common in samples from the Upper Liassic of Rudd's Pit, Grantsham, England.

Discussion.—Numerous specimens of this

very characteristic species were found in two samples received from Mr. Macfadyen, that were supposed to contain numerous specimens of *Epistomina*. The dorsal ornamentation with raised sutural ridges undoubtedly suggests certain species of that genus from the Lower Cretaceous and Jurassic, but the apertural characters and the stellar alternating chambers on the ventral side are characteristic features of the genus *Asterigerina*. This species differs from all others assigned to the genus by its sutural ornamentation. The oldest previously recorded species occurs in the Lower oolite of Germany and Holland and is quite different from this one which is named in honor of Dr. Macfadyen who sent me the samples.

COMMITTEE ON TECHNIQUES IN INVERTEBRATE PALEONTOLOGY

The last session of the meeting of the Paleontological Society in Chicago on December 26–28, 1946, was devoted to a round-table discussion on methods in paleontology. Some of the discussion was devoted to techniques applicable to invertebrate paleontology. Several persons expressed the desire that explanations of such techniques be made available to a larger number of students.

To fulfill this purpose, the President of the Paleontological Society, Dr. Raymond C. Moore, appointed a Committee on Techniques in Invertebrate Paleontology, to collect and publish information on new methods and to prepare subjects for discussion at the next meeting of the Paleontological Society.

A list of the members of the Committee and their addresses follows:

Dr. W. Charles Bell, Department of Geology, University of Minnesota, Minneapolis, Minn.
Dr. G. Arthur Cooper, U. S. National Museum, Washington 25, D. C.
Dr. Norman D. Newell, American Museum of Natural History, New York, N. Y.
Dr. Franco Rasetti (chairman), Faculty of Science, Blvd. de l'Entente, Quebec, Canada.
Dr. Hans E. Thalmann, Room 647, 26 Broadway, New York 4, N. Y.

The Committee would greatly appreciate the collaboration of all paleontologists acquainted with new or little known techniques in invertebrate paleontology and requests them to communicate their knowledge to any one of its members. The Committee will endeavor to collect all available information on such techniques and discuss with communicants the most convenient form in which their contributions may be published.

As a beginning of a series of short articles of this type, some improvements in techniques that were reported by Dr, Rassetti at the Chicago meeting are described in the following paper.

NOTES ON TECHNIQUES IN INVERTEBRATE PALEONTOLOGY

FRANCO RASETTI
Laval University, Quebec, Canada

ABSTRACT—The following techniques are described: (1), use of magnesium oxide smoke for whitening fossils for photography. (2), cleaning calcareous fossils by means of oxalic acid solution. (3), preparing metal casts from natural moulds of small fossils in siliceous rock.

WHITENING FOSSILS WITH MAGNESIUM OXIDE

Good photographs of fossils can usually be obtained only when the fossils have been whitened. Most paleontologists use the ammonium chloride method for this purpose. This method presents several inconveniences, chiefly the irritating smell of the ammonia and hydrochloric acid vapors employed, the risk of corrosion of calcareous fossils if there is an excess of acid, and the difficulty of operating in humid weather owing to the hygroscopic properties of the ammonium chloride deposit.

These inconveniences are not present in the magnesium oxide method. This method is so obvious that it has certainly been employed before, but the writer knows of no published reference to it, and it does not seem to be widely known to paleontologists. This justifies a brief description of the procedure.

A piece of magnesium ribbon about an inch long is ignited in a gas or candle flame and the fossil, held with tweezers, is moved rapidly back and forth about two inches above the burning magnesium. Motion is necessary to obtain a uniform deposit. From two to ten seconds is sufficient for small fossils, the time depending on the thickness of the coating required.

It is difficult to coat an area of more than about one square inch at a time, and for larger specimens the procedure must be repeated. Some experience may be required in order to obtain a fairly uniform whitening in such cases.

The magnesium oxide is deposited as an extremely fine crystalline powder. Being insoluble in water and not hygroscopic, the coating will remain until it is rubbed off. Washing and rubbing with a soft brush removes it easily.

This procedure is quick, simple, and cheap, since a roll of magnesium ribbon sufficient for many years' work costs about sixty cents. The only inconveniences that the method may present in certain cases are: (1) it may be difficult to cover a large area uniformly. (2), the slight heating produced by the flame may be sufficient to melt the surface layer of a wax cast, hence this method cannot be used with such casts. There is no possibility of harm to fossils from the heat.

The writer usually whitens all fossils to be studied even those that will not be photographed. Many features stand out much more clearly on the coated surface, especially if the specimen is dark colored.

CLEANING FOSSILS WITH OXALIC ACID

Calcareous fossils in an argillaceous limestone matrix usually weather out beautifully under natural conditions. This effect is probably due to the porosity of the matrix, which is more readily soluble than a pure limestone and which is also easily disintegrated by the action of the frost.

The writer found that the action of natural agents can be duplicated to some extent by the use of a saturated solution of oxalic acid. Pure crystalline calcium carbonate is hardly attacked by a solution of oxalic acid at room temperature, probably because a thin layer of highly insoluble calcium oxalate deposited on the surface prevents further action. However, the solution will attack weathered argillaceous limestone rather rapidly, probably because porosity makes the attack effective within the rock instead of only at the surface. The carbonate component of the rock is dissolved and the clay remains as a fine mud. This method is particularly effective with fossils which have weathered out of rock of this type, but are not quite clean, the depressions being still filled with matrix. The oxalic acid solution will clean such fossils beautifully in 2 to 12 hours, without visible damage to the surface. This method has been applied by the writer to trilobites, brachiopods, bryozoans and echinoderms. Specimens from the Trenton limestones of Quebec, the Whitehead formation of Gaspé, the Paint Creek and McLeansboro formations of Illinois, to mention a few examples, have responded excellently to this treatment.

Rubbing with a toothbrush and soap will remove the mud that may be left in the depressions of the specimens, and also a whitish layer, probably calcium oxalate, that may form on the surface of the fossils if kept too long in the acid.

The oxalic acid does not attack magnesian limestones.

METAL CASTS OF SMALL FOSSIL

Calcareous fossils in siliceous shales are often dissolved by ground waters, leaving cavities in place of the fossils. If these cavities present even a very small opening to the surface, they can be filled with metal and give perfect replicas of the fossils by the procedure here described.

The rock specimen must be cut in the shape of a disk by means of a diamond saw or similar tool. A test tube is selected, of such diameter that the shale disk will slide into it but fit fairly snugly. The tube must have a flat bottom, against which the speci-

men rests, the surface on which the fossil appears facing upward. The specimen must be held at the bottom by a fairly strong steel or brass wire ring pressing against the inside wall of the tube to prevent it from floating on the metal.

A low-melting alloy is used. The following which melts at 91°C. (hence in boiling water) is very convenient:

Bismuth	52%
Lead	40%
Cadmium	8%

A piece of this alloy is placed on top of the specimen in the test tube. The latter is closed with a perforated rubber stopper holding a narrow glass tube connected to a vacuum pump (such as the Cenco Hyvac). The test tube is immersed in a beaker filled with water kept boiling over a small flame or an electric plate and the alloy soon melts.

Air contained in the cavities of the specimen, and adsorbed within the rock itself, is removed by action of the pump and bubbles through the molten metal. This bubbling will continue for half an hour or more even if the specimen had been well dried. When bubbling has ceased, the tube is disconnected from the pump and removed from the hot water bath. Atmospheric pressure, acting on the surface of the metal, presses it into the smallest cavities, as these have been evacuated. It is absolutely necessary that there be enough metal to cover the surface of the rock and the wire ring completely after the cavities have been filled.

The test tube is then immersed in cold water and the metal quickly solidifies. The tube must be destroyed as it is otherwise impossible to extract the metal cylinder with the enclosed rock specimen. The rock will be completely enclosed, as some metal always penetrates between the specimen and the bottom of the tube. One must saw the metal all around in order to remove this lower layer and expose the lower surface of the specimen.

The last step of the process consists in dissolving away the rock and leaving the metal cast free. The specimen is immersed in concentrated hydrofluoric acid contained in a plastic or paraffin wax vessel, the cylinder resting on its side rather than on one of the ends. About two days will be required to dissolve a quarter-inch layer of shale. The alloy is not in the least attacked by hydrofluoric acid.

When the rock has been dissolved, the metal piece is carefully washed and dried. Casts of the fossils will usually remain attached to the upper metal disk, and the rim which remains around the sides will protect them from contact in handling. This is important because the thin casts are very delicate. The finest details of the fossils are reproduced in metal. The writer has applied this method chiefly to a fine-grained, siliceous Middle Cambrian shale from New Brunswick. Tests of small eodiscid trilobites and sponge spicules have been beautifully reproduced. The trilobite tests show the features of both upper and lower surfaces, just like silicified fossils etched from limestone. Even the slender occipital spines of these small trilobites are perfectly reproduced and are hollow as in the original tests.

The time required for this method is considerable, hence it is worth while only in special cases, when one wishes to investigate features of small fossils which cannot be studied otherwise.

JOURNAL OF PALEONTOLOGY, VOL. 21, NO. 4, P. 400, JULY 1947

NOMENCLATURAL NOTES

NEW NAMES FOR JUNIOR HOMONYMS

The Joint Committee on Zoological Nomenclature for Paleontology in America wishes to call the attention of authors who currently propose new names for junior homonyms that, for their new names to be valid and available under Article 25 C 2 of the Rules as Interpreted by Opinion 138, the proposal must include a definite and *complete* bibliographic reference to the proposal of the invalid name to be replaced, *including the page number.*

Many authors seem to be unfamiliar with Opinion 138 of the International Commission for several new names replacing preoccupied names of both genera and species have appeared recently in this Journal without meeting its requirements. The Title and Summary of Opinion 138 read as follows:

On the method by which the amendment to Article 25 of the International Code adopted at the Budapest meeting of the International Zoological Congress, Relating to the Replacement of Invalid names, should be interpreted.

Summary.—In order to comply with Article 25 of the International Code as amended at the Meeting of the International Zoological Congress held in Budapest in 1927, it is necessary for an author publishing a new name in substitution for an invalid name, after giving the name to be replaced and its author, to cite also the year in which that name was published and to indicate the title of the work or journal in which the name to be replaced was first published, and, in all cases where the pages of the work concerned are numbered, *to cite the number of the page* on which the name to be replaced was printed.

(Italics ours.)

UNESCO AID FOR THE INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE

In December 1946 the Committee on Zoological Nomenclature of the Smithsonian Institution learned that the International Commission on Zoological Nomenclature had requested UNESCO to subsidize a part of the operations of the Commission including the salary of a full-time Assistant Secretary. Such a subsidy seemed necessary if the Commission is to function effectively for the business of the Commission had grown by leaps and bounds and could no longer be handled adequately by an unpaid Secretary who could devote to the Commission's business only time free from the requirements of another full-time position. The Smithsonian Committee agreed to petition UNESCO in support of the request of the International Commission and also obtained endorsements on their petition from the Joint Committee on Zoological Nomenclature for Paleontology in America, the Paleontological Society, the Society of Economic Paleontologists and Mineralogists, the Society of Vertebrate Paleontology, the Geological Society of America, and many other bodies in this country interested in the success of the Commission in carrying out its duties effectively.

Under date of May 29, 1947 each of the endorsing societies received a letter reading as follows:—

"I have the pleasure to inform you that the application to UNESCO for funds for the International Commission on Zoological Nomenclature, which your organization joined us in supporting, has resulted in a grant of $10,936.

"The Secretary of the Commission, Mr. Francis Hemming, has asked me to forward to you the thanks of the Commission. It is confidently expected that the grant will enable the Commission greatly to accelerate the rate of its work and also to reduce the charges for its publications.

"The Smithsonian Committee is very grateful for your cooperation in this important petition.

Very Sincerely yours
SIGNED
RICHARD E. BLACKWELDER, Secretary
Committee on Zoological Nomenclature
of the Smithsonian Institution."

JOURNAL OF PALEONTOLOGY, VOL. 21, NO. 4, PP. 401–408, JULY 1947

SOCIETY RECORDS AND ACTIVITIES

REPORTS AND MINUTES OF THE TWENTY-FIRST ANNUAL MEETING OF THE SOCIETY OF ECONOMIC PALEONTOLOGISTS AND MINERALOGISTS

The twenty-first annual meeting of the Society of Economic Paleontologists and Mineralogists was held in the Biltmore Hotel in Los Angeles, California, March 24–27, 1947, in conjunction with the annual meeting of The American Association of Petroleum Geologists.

The Presidential Address of the Society, "Environmental Conditions during Deposition of Several Formations in the Ancient Gulf of Mexico," was given by F. W. Rolshausen in the joint session on Tuesday, March 25, 1947.

The first part of the technical program of the Society, with James M. Hamill and U. S. Grant, IV, presiding, began at 9:00 A.M., Wednesday, March 26, and continued until 5:00 P.M. The following papers were presented in the order given.

M. L. Natland, "Methods in Micropaleontology"

Stanley G. Wissler and F. D. Crawford, "A Brief Review of the Stratigraphy and Micropaleontology of the Los Angeles Basin"

George C. Kuffel, "The Ventura Basin"

Aden W. Hughes, "Stratigraphy of the Santa Maria District"

Paul P. Goudkoff, "Stratigraphy of Sacramento Valley"

Boris Laiming, "Stratigraphy of the Central Part of the Great Valley"

William F. Barbat, "Stratigraphy of San Joaquin Valley"

C. D. Redmond, "Occurrence in Colombia of Asterigerina Crassaformis"

C. M. Bramine Caudri (read by C. D. Redmond), "A Note on the Stratigraphic Distribution of Lepidorbitoides"

Henry V. Howe, "Revision of the Ostracode Genus Buntonia"

J. Harlan Johnson, "Eocene Algae from Florida"

H. B. Stenzel, "The Major Groups of the Family Ostreidae"

Daniel J. Jones and H. M. Barton, "Minute Spore-like Fossils from Upper Cretaceous Shales"

Daniel J. Jones, "Permian Plant Remains from the Subsurface of West Texas"

The following papers were read by title.

Pedro Joaquin Bermudez, "The Tertiary Smaller Foraminifera of the Dominican Republic"

R. M. Stainforth, "Applied Micropaleontology in Coastal Ecuador"

W. T. O'Gara, "Upper Eocene Echinoids from Colombia"

The second part of the technical program, with R. Dana Russell presiding, began at 9:00 A.M., Thursday, March 27, and continued until 11:00 A.M. The following papers were presented.

W. C. Krumbein, "Shales and Their Environmental Significance"

E. C. Dapples, "Properties of Sandstones Resulting from Environmental Conditions"

M. L. Natland, "Probable Depositional Environment of the Repetto Conglomerates"

W. H. Twenhofel, "Environmental Significance of Conglomerates"

M. K. Elias (read by Herschel L. Driver), "Algae Reefs"

Paul D. Krynine's paper, "Limitations of the Environmental Concept" was read by title.

The annual business session of the Society was called to order at 11:15 A.M., Thursday, March 27, by President F. W. Rolshausen.

The minutes of the 1946 meeting were approved as published in the *Journal of Paleontology*, Vol. 20, No. 4 (July, 1946).

The following reports were given.

1. *Report of the Editor of the Journal of Paleontology* (*J. Marvin Weller*).—Volume 20 of the *Journal of Paleontology*, issued in conjunction with the Paleontological Society in 1946, contains 633 pages and 88 collotype plates. Published in it are 48 paleontological papers, 1 paper on techniques, 3 bibliographies, 20 notes, 4 reviews, data relating to the activities and memberships of the two societies, and various errata.

The March, July, and November issues were prepared by your editor in behalf of the

Society of Economic Paleontologists and Mineralogists. These numbers consist of 321 pages and 45 collotype plates, an increase of 17 pages and 5 collotype plates over those of the previous volume. The contributions in these numbers may be classified as follows.

	Paleozoic	*Mesozoic*	*Cenozoic*
Algae	1	1	
Foraminifera	1	2	3
Corals			1
Conodonts	1		
Cephalopoda	4		
Trilobita	1		
Ostracoda	1	5	1

Four of these papers describe fossils from foreign countries. In addition two papers are devoted to bibliography.

The situation with regard to manuscripts submitted for publication is gradually improving and an increasing number of papers is being received from foreign authors.

Work on an index to the first 20 volumes of the *Journal of Paleontology* by Michael S. Chappars is progressing satisfactorily and this should be ready for publication before the end of the year.

2. *Report of the Editor of the Journal of Sedimentary Petrology* (*W. H. Twenhofel*).—Thirteen articles by as many authors were published in the *Journal of Sedimentary Petrology* during the year 1946. These covered 118 pages. There were also published seven pages of reviews and announcements. Several of the articles are considered of significant importance. Conditions, with respect to submission of manuscripts, have greatly improved from what existed during the war period, but are still not completely satisfactory. With the release of several of the associate editors from work connected with the war, it is thought that the *Journal* may look to the future with optimism. It is hoped that the many members of the S.E.P.M. who are interested in sedimentation will organize data derived from their studies and give to their fellow sedimentationists the benefit of what they have observed and learned.

3. *Report of the Secretary-Treasurer* (*H. B. Stenzel*).—

BACK VOLUME SALES

Back volumes of the Journal of Paleontology	$1,374.80
Back volumes of the Journal of Sedimentary Petrology	701.00

PRINTING AND ENGRAVING BILLS FOR 1946

Journal of Paleontology

	Banta Printing Bills	*Meriden Engraving Bills*	*Total Printing and Engraving Bills*	*S.E.P.M. Total Printing and Engraving Bills*
Number 1 (January)*	$ 750.18	$ 285.08	$1,035.26	
Number 2 (March)	847.88	424.16	1,272.04	$1,272.04
Number 3 (May)*	777.94	279.86	1,057.80	
Number 4 (July)	797.38	362.68	1,160.06	1,160.06
Number 5 (September)*	937.40	533.84	1,471.24	
Number 6 (November)	943.80	411.84	1,355.64	1,355.64
	$5,054.58	$2,297.46	$7,352.04	$3,787.74
(1945 Totals)	($4,586.29)	($1,678.72)	($6,265.01)	(3,150.90)

* Odd numbers paid by Paleontological Society.

Journal of Sedimentary Petrology

Number 1 (April)	$ 444.30
Number 2 (August)	417.92
Number 3 (December)	346.42
	$1,208.64
(1945 Total)	($758.06)

MEMBERSHIP, MAILING, AND JOURNAL STATISTICS

	March 1947	*March 1946*	*March 1945*
1. S.E.P.M. Membership:			
Active Members	306	279	268
Associate Members	90	77	75
TOTAL	396	356	343
2. Journal of Paleontology Mailing List:			
S.E.P.M. Active Members	230	218	212
S.E.P.M. Associate Members	58	49	49
Subscribers	371	380	308
P.S. Members	351	343	332
TOTAL	1,010	990	901
3. Journal of Sedimentary Petrology Mailing List:			
S.E.P.M. Active Members	156	139	133
S.E.P.M. Associate Members	31	26	25
S.E.P.M. Subscribers	266	283	245
TOTAL	453	448	403

4. Number of pages in 1946 Journal of Paleontology	633 (664, 1945)
5. Number of plates in 1946 Journal of Paleontology	90 (88, 1945)
6. Total edition of the 1946 Journal of Paleontology	1300 (1300, 1945)
7. Number of pages in 1946 Journal of Sedimentary Petrology	132 (104, 1945)
8. Total edition of 1946 Journal of Sedimentary Petrology	600 (500, 1945)
New Members from March 1, 1946, to March 1, 1947	32 (16, 1945–1946)
New Associates from March 1, 1946, to March 1, 1947	16 (3, 1945–1946)
Transfers to active membership, March 1, 1946, to March 1, 1947	2 (1, 1945–1946)
Reinstatement to active membership, March 1, 1946, to March 1, 1947	3 (3, 1945–1946)

FINANCIAL STATEMENT, DIVISION OF PALEONTOLOGY AND MINERALOGY, FOR THE YEAR 1946

To the Council
of Society of Economic Paleontologists and Mineralogists:

We have examined the balance sheet of SOCIETY OF ECONOMIC PALEONTOLOGISTS AND MINERALOGISTS at December 31, 1946, and the statement of income for the year then ended, have reviewed the system of internal control and the accounting procedures of the Society and, without making a detailed audit of the transactions, have examined or tested accounting records of the Society and other supporting evidence, by methods and to the extent we deemed appropriate. Our examination was made in accordance with generally accepted auditing standards applicable in the circumstances and included all procedures which we considered necessary.

In our opinion, the accompanying balance sheet and statement of income present fairly the position of SOCIETY OF ECONOMIC PALEONTOLOGISTS AND MINERALOGISTS at December 31, 1946, and the results of its operations for the year then ended, in conformity with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

(Signed) ARTHUR YOUNG & COMPANY

TULSA, OKLAHOMA
February 4, 1947

BALANCE SHEET
AT DECEMBER 31, 1946

Assets

CURRENT ASSETS:		
Demand deposits		$ 6,306.26
Savings deposit		2,276.62
Accounts receivable less reserve, $17.87		43.73
TOTAL CURRENT ASSETS		$ 8,626.61
PUBLICATIONS:		
25,006 Journals of Paleontology issued prior to 1946 (comprising 4,222 complete volumes) at $.50 per Journal	$12,503.00	
1,065 Journals of Paleontology, issues 1 to 6 of 1946, at cost	1,027.60	
4,323 Journals of Sedimentary Petrology issued prior to 1946 (comprising 1,467 complete volumes) at $.50 per Journal	2,161.50	
209 Journals of Sedimentary Petrology, issues 1, 2, and 3 of 1946, at cost	153.01	15,845.11
FURNITURE AND FIXTURES less reserve, $439.30		98.74
DEFERRED CHARGES		162.24
TOTAL ASSETS		$24,732.70

Liabilities and Surplus

CURRENT LIABILITIES:		
Accounts payable		$ 1,295.78
Amount payable to Paleontological Society		954.84
Accrued printer's charges		162.24
TOTAL CURRENT LIABILITIES		$ 2,412.86
DEFERRED INCOME:		
Subscriptions to journals	$ 2,196.95	
Membership dues for 1947 and 1948	1,398.72	3,595.67
SURPLUS:		
Balance, December 31, 1945	$18,909.21	
Net (loss) for year ended December 31, 1946 (per statement attached)	(185.04)	
Balance, December 31, 1946		18,724.17
TOTAL LIABILITIES AND SURPLUS		$24,732.70

STATEMENT OF INCOME FOR YEAR ENDED DECEMBER 31, 1946

INCOME:		
Membership dues and subscriptions—		
Journal of Paleontology and Sedimentary Petrology	$ 904.00	
Journal of Paleontology	3,568.18	
Journal of Sedimentary Petrology	1,251.18	$5,723.36
Sales of back numbers—		
Journal of Paleontology	$1,471.20	
Journal of Sedimentary Petrology	547.30	2,018.50
Sales of plates and reprints		236.64
Advertising		62.46
Donation from The American Association of Petroleum Geologists		1,500.00
Miscellaneous		34.73
TOTAL INCOME		$9,575.69
Less: Proportion of income accrued to Paleontological Society		954.84
INCOME		$8,620.85

COSTS AND EXPENSES:		
Cost of printing—		
Journal of Paleontology	$3,918.82	
Journal of Sedimentary Petrology	1,337.82	
	$5,256.64	
Clerical salaries	1,040.00	
Office supplies and expenses	158.94	
Office rent	405.00	
Insurance and bond	54.85	
Donation to Department of Micropaleontology of American Museum of Natural History	500.00	
Postage, telegraph, and delivery expense	429.79	
Audit fee	100.00	
Taxes	15.60	
Depreciation	53.80	
Miscellaneous	25.95	
TOTAL COSTS AND EXPENSES	$8,040.57	
Adjustment for decrease in inventory of publications	765.32	8,805.89
NET (LOSS)		$(185.04)

4. *Report of the Committee for Rehabilitation of Foreign Libraries (Stanley G. Wissler, Chairman).*—This committee was composed of Norman D. Newell, New York, J. Brookes Knight, Washington, and the chairman. The report of the committee was presented to the meeting and discussed.

5. *Report of the Committee on Ways and Means of Honoring Distinguished Members of the Society (John B. Reeside, Jr., Chairman).*—A report of the committee was presented to the meeting and discussion followed.

6. *Report of the Joint Committee on Zoological Nomenclature for Paleontology in America (J. Brookes Knight, Chairman).*—The By-Laws of the Joint Committee on Zoological Nomenclature for Paleontology in America require that the policy board of the committee make a report on the activities of the committee for the past year to the secretaries of the three sponsoring societies by December 15 of each year. The first report was made on December 11, 1945, although the committee was not fully organized then.

Organization matters. Although not yet fully organized the committee started to function and an informal meeting of the committee members present was held during the December meetings of the Paleontological Society at noon, December 28, in the Hotel William Penn at Pittsburgh. This meeting was devoted to informal discussion of the committee program. After the meeting of the full committee, a meeting of the incoming policy board for 1946 was held and Dr. Knight was re-elected as chairman.

During Christmas week, the Council of the Paleontological Society ratified the actions of its representative, Carl O. Dunbar, in participating in the forming of the Joint Committee. Since Professor Dunbar's term as a member of the committee's policy board expired on December 31, 1945, the Council of the Paleontological Society appointed John B. Reeside as its representative for the term expiring December 31, 1948. Likewise, the membership of the Society of Vertebrate Paleontology at its annual meeting in Pittsburgh during Christmas week approved of "the formation of and its participation in" the Joint Committee. It also confirmed Prof. A. S. Romer as its member of the committee's policy board for the term expiring in December, 1946.

At the annual meeting of the membership of the Society of Economic Paleontologists and Mineralogists held at the Stevens Hotel in Chicago on April 3, 1946, a resolution was passed ratifying the action of its representative, J. Brookes Knight, in the formation of the Joint Committee and confirming his appointment as the Society's representative. This action finally completed the formalities of organization and the Joint Committee became fully, and formally, operative.

Educational. In support of its announced primary objective, to encourage "the fullest understanding and use of the official publications of the International Commission on

Zoological Nomenclature," the committee has sponsored the following items published in volume 20 of the *Journal of Paleontology*.

(a) An article announcing the formation of the Joint Committee, its By-Laws, its objectives, its procedure, and membership, entitled "Joint Committee on Zoological Nomenclature for Paleontology in America." *Jour. Paleont.* Vol. 20, pp. 288–90.
(b) "Publications of the International Commission on Zoological Nomenclature," pp. 291–94. This is apparently the first complete list of the publications issued by the International Commission beginning in 1943 under its new secretariat.
(c) "Reduction in Prices of Zoological Commission Publications," pp. 391–93.
(d) "Recent Publications of the International Commission on Zoological Nomenclature," p. 519.

Nomenclatural problems. Early in the "informal stage" of the Joint Committee's existence, Prof. Harold E. Vokes, a member of the International Commission, suggested that the committee consider the implications of Opinion 1 of the International Commission as interpreted by Secretary Hemming in the re-issue of Opinion 1. (Opinions and Declarations rendered by the International Commission on Zoological Nomenclature, Vol. 1, Pt. 10, pp. 73–86.) Since the committee was not fully operative at that time your chairman undertook to canvass the views of numerous representative taxonomists in the United States and England. In this he was considerably aided by members of the Joint Committee. As a result of this canvass the policy board of the Joint Committee in May decided to petition the International Commission to give recognition to the views of the great majority of the taxonomists canvassed and to amend Opinion 1 to obtain a more rational, less ritualistic interpretation of the word "indication" in Article 25 of the Règles. A copy of the petition is attached hereto.

A number of nomenclatural questions have been submitted by letter to your chairman for informal advice and the informal solutions offered seem to have been appreciated. A great many more questions have been posed orally by colleagues in Washington. One member of the committee, Stenzel, was completing a nomenclatural synopsis of supraspecific groups of the family Ostreidae (Pelecypoda, Mollusca), in which a number of puzzling nomenclatural problems arose. At his request for aid, your chairman asked Committeeman Keen to discuss the points with the author. This she did and to judge by the copies of the correspondence received, with profit not only to themselves but to the article, which was published in the *Journal of Paleontology*, Vol. 21, No. 2. It is results such as this that are gratifying.

On the other hand, one disadvantage inherent in a committee like ours is that virtually all discussions amongst committee members must be by correspondence. The burden of this correspondence on the members is considerable and when an attempt is made to bring all members of the Committee into the discussion, it is insupportable. In order to mitigate this burden we have attempted the experiment of presenting various problems to subcommittees of three and at present several such subcommittees are deliberating. One subcommittee headed by Newell is considering the problem of subspecific names. Others are considering various questions now before the International Commission to see if the Joint Committee should make a recommendation to the International Commission on behalf of American Paleontology. A subcommittee headed by Wells is considering the advisability of the International Commission recognizing "neotypes." Still another headed by Keen has just made a report of its deliberations on the question of "the status, under Article 25 . . . , of generic names where the genera concerned are founded upon figures only."

General. Thus matters have gone for the first part-year of the committee's official existence. So far too few paleontologists have felt the need to consult the committee strongly enough to overcome the natural reluctance to write things out. If they could just drop in informally, the experience in Washington suggests the committee's services would be utilized more frequently. But to put the data down on paper—that is generally too much. If our committee fails in its advisory function, it will probably be for that reason.

The committeemen have responded beautifully to the calls of the chairman. A few have had too pressing engagements in other directions to permit them to accept the more exacting assignments such as sub-

committee chairmanships, but these too are interested and have accepted the less exacting assignments effectively. If the chairman has any complaint it is that the initiative is left to him to too great a degree. He, too, is busy on other matters and cannot let the committee become a full-time job, as it easily might. He hopes that other members of the committee will give thought to the problems of International Zoological Nomenclature and to the committee's relations thereto and that suggestions will be forthcoming.

7. *Report on the Department of Micropaleontology of the American Museum of Natural History* (*Brooks Ellis, Chairman*).—During the past year the Department of Micropaleontology at the American Museum of Natural History has been able to increase its staff to five persons and to add considerably to its equipment and facilities. This expansion has been made possible through the activities of the Museum's Board of Advisers on Micropaleontology and the financial and moral backing of the S.E.P.M. and the A.A.P.G. A drive for additional financial support in the form of endowment or annual grants is now being made by the Museum. It is hoped that this drive will supply the means to place the department on a sound financial basis, on a scale sufficiently extensive to enable it to render maximum service to subscribers.

The results of a questionnaire sent to all corporate members and a poll of micropaleontologists conducted by the Board of Advisers on desirable departmental activities indicate that the first preference of practically everyone is to bring the Catalogue of Foraminifera up to date. The second choice is an Illustrated Index to the occurrence of forms, possibly on a regional basis. As this index is already in existence the chief problem is the best form in which to make it available to subscribers. An annotated bibliography and an index to synonymy were third and fourth choices, respectively. A depository of types and faunas was also favored by many, while a working depository for the exchange of faunas was widely endorsed.

It is the intention of the chairman of the department to undertake these projects in order of preference indicated by the questionnaire and the poll. Micropaleontologists can materially aid in this work by seeing that copies of their papers reach the Department of Micropaleontology as soon as possible after publication and that types and faunas be deposited as soon as the material can be made available.

Inasmuch as the number of sets of the Catalogue available for distribution is less than 75, and the demand for membership by European companies and colleges is rapidly increasing, American institutions and companies wishing membership are urged to apply without delay. Brochures describing the Catalogue and membership are available at the A.A.P.G. desk. Sample volumes of the Catalogue may be inspected there also.

Unfortunately, membership is no longer offered to individuals because all available sets of the Catalogue of Foraminifera have been reserved for companies and educational institutions. However, the Department of Micropaleontology is attempting to recover inactive sets in order that they may be reassigned to those who will use them actively and who will maintain their membership. Persons who wish to sell their sets back to the Department, as well as those wishing to secure one of these reclaimed sets, should get in touch with Dr. Ellis at once.

8. Stanley G. Wissler presented a report on advertising and subscriptions for the *Journals*. This report was an outgrowth of the discussions of the Committee on Rehabilitation of Foreign Libraries. The suggestions contained in the report were discussed and received favorable comment.

The following resolutions were passed.

1. It was moved, seconded, and carried that all reports be approved and accepted for publication in the *Journal of Paleontology*.

2. It is recommended that the incoming president appoint a committee of four to assemble data and study the problem of awards for papers by students and others published in the *Journals* and report to the next business session of the Society.

3. It was moved, seconded, and carried that the report on advertising and subscriptions for the *Journals* presented by Stanley G. Wissler be submitted to the incoming officers for their consideration.

4. Be it resolved that we express our

gratitude and appreciation to the many individuals and organizations who have contributed to the success of the Los Angeles meeting, especially to the following.

William Henry Corey, President of the Pacific Coast Section

Miss Jane Everest, Secretary-Treasurer of the Pacific Coast Section

Herschel L. Driver, General Chairman and Chairman of the Program Committee

Wilbur D. Rankin, Chairman of the Committee on Field Trips

Stanley S. Siegfus, Chairman of the Committee on Arrangements

5. It was moved, seconded, and carried that a vote of thanks be given to the outgoing officers.

6. Be it resolved that the S.E.P.M. deeply appreciates the support of The American Association of Petroleum Geologists, both in financing our publications and in its encouragement of stratigraphic investigations.

The results of the election of officers by mailed ballot, for the new year, were announced by outgoing President Rolshausen and incoming President J. A. Waters as follows.

President: James A. Waters

Vice-President: W. C. Krumbein

Secretary-Treasurer: Henryk B. Stenzel

The business session adjourned at 1:30 P.M., Thursday, March 27, 1947.

UNIVERSITY OF KANSAS PALEONTOLOGICAL CONTRIBUTIONS

The birth of a new series of papers devoted to paleontology is marked by the appearance in January, 1947 of the University of Kansas Paleontological Contributions, no. 1. This number is devoted to an extended article by R. M. Jeffords on "Pennsylvanian Lophophyllidid Corals." Page size is 8 by 11 inches, set in two columns of type. Illustrations have been generously supported, Jeffords' 84 page article containing 9 text figures, 26 plates of zinc etchings and 2 collotype plates.

Editor of the series is R. C. Moore; E. R. Hall and L. R. Laudon are associate editors. The plan of distribution printed on the flyleaf states:

> These publications are distributed from Lawrence, Kansas, being sent as exchanges to scientific institutions, libraries, and, on request, to individual specialists in paleontology throughout the world. Requests for numbers should be addressed to The Director of Libraries, University of Kansas, Lawrence, Kansas, accompanied by 25 cents for mailing charge on each number; payment of this charge is normally required in order to obtain copies.

A. SCOTT WARTHIN

OFFICERS OF THE SOCIETIES

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President, JAMES A. WATERS, Dallas, Tex.,

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Second Past-President, JOHN R. SANDIDGE, San Antonio, Tex.

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Editors

J. MARVIN WELLER, Chicago, Ill., for paleontology.

W. H. TWENHOFEL, Orlando, Fla., for mineralogy.

THE AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS

For the year ending March 1948

President, C. E. DOBBIN, Denver, Colo.

Past-President, EARL B. NOBLE, Los Angeles, Calif.

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THE PALEONTOLOGICAL SOCIETY

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Ex-Presidents

B. F. HOWELL, Princeton, N. J., 1944.
CHESTER STOCK, Pasadena, Calif., 1945.
J. BROOKES KNIGHT, Washington, D. C., 1946.

JOINT COMMITTEE ON ZOOLOGICAL NOMENCLATURE FOR PALEONTOLOGY IN AMERICA

Sponsored by the Society of Economic Paleontologists and Mineralogists, The Paleontological Society, and the Society of Vertebrate Paleontology in support of the International Commission on Zoological Nomenclature.

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Address all communications to the chairman, J. BROOKES KNIGHT, U. S. National Museum, Washington 25, D. C.

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For the year ending December 1947

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